USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with South Dakota Agricultural Experiment Station

Soil Survey of Kingsbury County, South Dakota

How To Use This Soil Survey

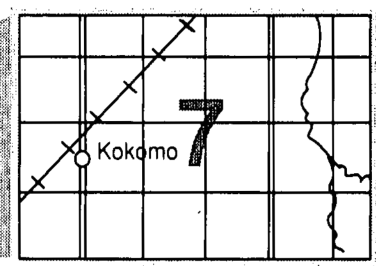
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

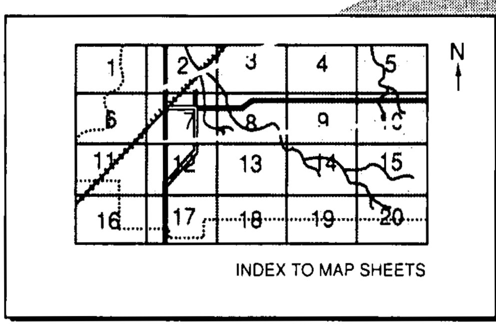
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



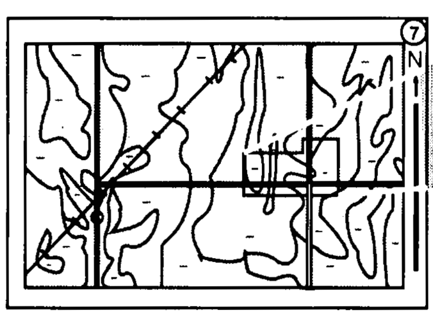
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



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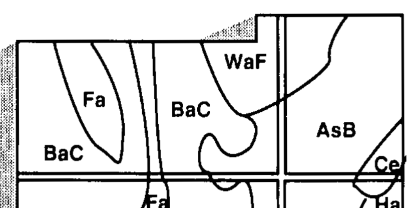

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Kingsbury County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Contour farming in an area of Poinsett-Buse-Waubay complex, 2 to 9 percent slopes.

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Foreword

This soil survey contains information that can be used in land-planning programs in Kingsbury County, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of
Kingsbury County, South Dakota

By Regis L. Vialle, Natural Resources Conservation Service

Soils surveyed by Daniel J. Brady, Karl J. Krueger, Thomas M. Schumacher, Regis L. Vialle, Steven D. Winter, and Mary L. Woolf, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the South Dakota Agricultural Experiment Station

KINGSBURY COUNTY is in the east-central part of South Dakota (fig. 1). It has a total area of 553,005 acres.

About 84 percent of the acreage in the county is used for cultivated crops or for tame pasture and hay (U.S. Department of Commerce, 1987), and about 11 percent is rangeland (USDA, 1987). Corn, spring wheat, soybeans, and alfalfa are the major crops. Oats, sunflowers, barley, rye, and grain sorghum are also important. Alfalfa, intermediate wheatgrass, and smooth brome are mainly grown for pasture and hay.

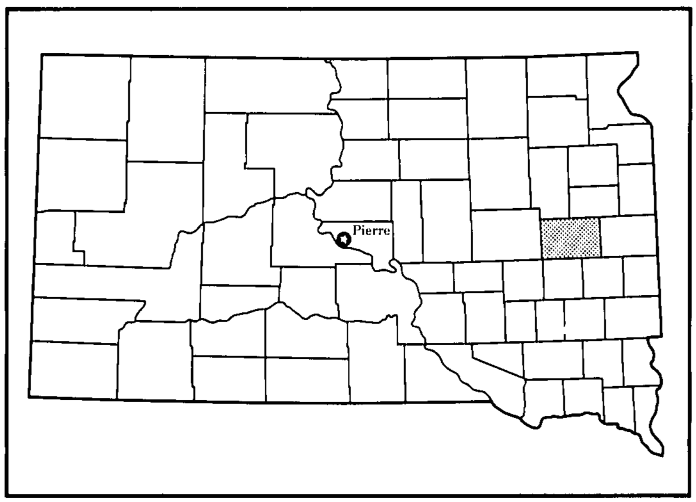

Figure 1.—Location of Kingsbury County in South Dakota.

General Nature of the County

This section provides general information about Kingsbury County. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at De Smet in the period 1951 to 1987. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 17 degrees F and the average daily minimum temperature is 7 degrees. The lowest temperature on record, which occurred at De Smet on January 29, 1966, is -32 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at De Smet on July 10, 1966, is 108 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base

temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 23.63 inches. Of this, 17 inches, or about 75 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 4.39 inches at De Smet on June 19, 1984. Thunderstorms occur on about 40 days each year.

The average seasonal snowfall is about 36 inches. The greatest snow depth at any one time during the period of record was 29 inches. On the average, 22 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 14 miles per hour, in spring.

Physiography, Relief, and Drainage

The western one-third of Kingsbury County is part of the James River Lowland. The rest of the county is on the Coteau des Prairies (Flint, 1955). The county is characterized by a nearly level to gently rolling landscape, except for level basins and a few steeper areas near drainageways or lakes.

The western part of the county is drained by Redstone, West Redstone, and Rock Creeks, by the South Fork of Pearl Creek, and by the West Fork of the Vermillion River. All of these watercourses flow generally southward. Except for the West Fork of the Vermillion River, they all empty into the James River. The central and eastern parts of the county have numerous short drainageways that terminate in lakes, marshes, or sloughs. Water levels in most of the lakes fluctuate rather dramatically over a period of years. The major lakes include Lake Albert, Lake Badger, Cherry Lake, Lake Henry, Lake Thisted, Spirit Lake, Lake Thompson, Lake Preston, and Lake Whitewood. During periods of extremely high water levels, water can flow from lake to lake. The East Fork of the Vermillion River begins near the south end of Lake Thompson.

Settlement

The survey area was inhabited by the Dakota tribe at the time of settlement by European immigrants, which began in the early 1870's. Kingsbury County was named for George W. Kingsbury, an editor, historian, author, and legislator from Yankton. The county was created in 1873 but was not organized until 1879 (South Dakota Crop and Livestock Reporting Service, 1968).

The population of the county has been declining since the 1930's. According to the 1990 census, the population is 5,925. De Smet is the county seat. Other major towns are Arlington, Badger, Lake Preston, Iroquois, and Oldham. Villages include Erwin, Bancroft, Hetland, Manchester, Osceola, and Esmond.

The county is served by U.S. Highways 14 and 81 and by State Highway 25. Also, roads are on most section lines. Most have a surface of gravel or asphalt. Most rural areas are served by all-weather roads that provide access to centers of trade. Freight service is provided by two railroads.

Farming

Farming is the principal enterprise in Kingsbury County. About 67 percent of the farm income is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). Many of the crops are used as feed for livestock.

In 1982, the county had 723 farms, which averaged about 662 acres in size (South Dakota Crop and Livestock Reporting Service, 1990). The trend is toward fewer and larger farms.

About 84 percent of the acreage is used for cultivated crops or for tame pasture and hay (U.S. Department of Commerce, 1987). Dryland farming is dominant. The main cropping system is row crops and small grain, and legumes are included in some rotations. Corn, spring wheat, soybeans, and alfalfa are the major crops. Alfalfa, intermediate wheatgrass, and smooth brome are mainly grown for pasture and hay. In 1989, according to the South Dakota Crop and Livestock Reporting Service, corn was harvested for grain on 87,500 acres. About 67,500 acres was used for spring wheat, including durum; 22,800 acres for oats; 15,500 acres for barley; 55,000 acres for soybeans; 10,400 acres for sunflowers for seed; 7,600 acres for winter wheat; 1,600 acres for rye; and 700 acres for grain sorghum (South Dakota Crop and Livestock Reporting Service, 1990).

Natural Resources

Soil is the most important natural resource in the county. It provides a growing medium for crops and for the grass grazed by livestock. Other natural resources are water, sand and gravel, and wildlife.

Surface water occurs in the form of several large lakes in the central and eastern parts of the county and

a few small reservoirs and ponds. Excavated ponds in areas of Oldham, Parnell, Southam, Tetonka, Tonka, Worthing, and other soils provide a source of water for livestock and wildlife.

Most water for domestic use is supplied from underground aquifers. Glacial aquifers of outwash sand and gravel are in parts of the county. These aquifers are at the surface in some areas or are at depths ranging to 600 feet (Hamilton, 1988). The Vermillion East Fork Aquifer, which stores an estimated 300,000 acre-feet of water, is especially important (Hamilton, 1988). A small amount of water from the glacial aquifers is used for irrigation.

The Codell and Dakota Sandstone Formations underlie most of the county. Depth to the top of these two aquifers ranges from 320 to 1,300 feet (Hamilton, 1988).

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads,

and rivers, all of which help in locating boundaries accurately.

Some of the soil names on the maps of this survey area do not coincide fully with those on the maps of the soil surveys of Beadle, Brookings, Clark, Hamlin, Lake, Miner, and Sanborn Counties. Differences are the result of variations in the design and composition of map units or of changes and refinements in series concepts.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the associations are in different landform positions (fig. 2). These different landform positions affect such characteristics as the amount of topsoil, the drainage class, the runoff rate, and the content of organic matter.

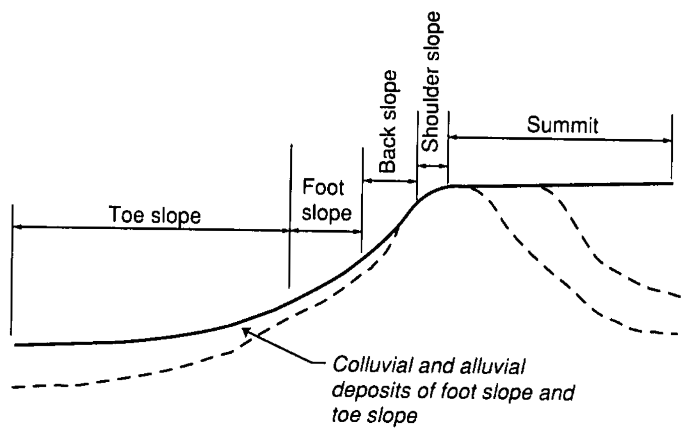

Figure 2.—Landform positions.

Soil Descriptions

Dominantly Nearly Level to Gently Rolling Soils That Are Well Drained and Moderately Well Drained

These soils dominantly are nearly level to gently rolling but are strongly sloping along some drainageways. They make up about 51 percent of the county. About 99 percent of the acreage is cropland. Corn, small grain, and soybeans are the main crops. Controlling erosion is the main management concern.

1. Poinsett-Waubay-Buse Association

Well drained and moderately well drained, dominantly nearly level to gently rolling, silty and loamy soils on till plains and moraines

This association is characterized by smooth slopes and scattered basins. Slopes generally are nearly level to gently rolling but are moderately steep along some drainageways and basins. The drainage pattern is fairly well defined. Drainageways typically terminate in lakes or large basins.

This association makes up about 46 percent of the county. It is about 55 percent Poinsett soils, 10 percent Waubay soils, 10 percent Buse soils, and 25 percent minor soils (fig. 3).

The well drained Poinsett soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is dark grayish brown, light olive brown, light yellowish brown, and light brownish gray silt loam. It is mottled and calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous silty clay loam and clay loam.

The moderately well drained Waubay soils are on foot slopes. Slopes range from 0 to 6 percent. Typically, the surface soil is very dark gray silty clay loam. The subsoil is dark grayish brown and light brownish gray silty clay loam. It is calcareous in the lower part. The underlying material is grayish brown, mottled, calcareous clay loam.

The well drained Buse soils are on shoulder slopes. Slopes generally range from 3 to 9 percent, but in some areas they range from 3 to 20 percent. Typically, the

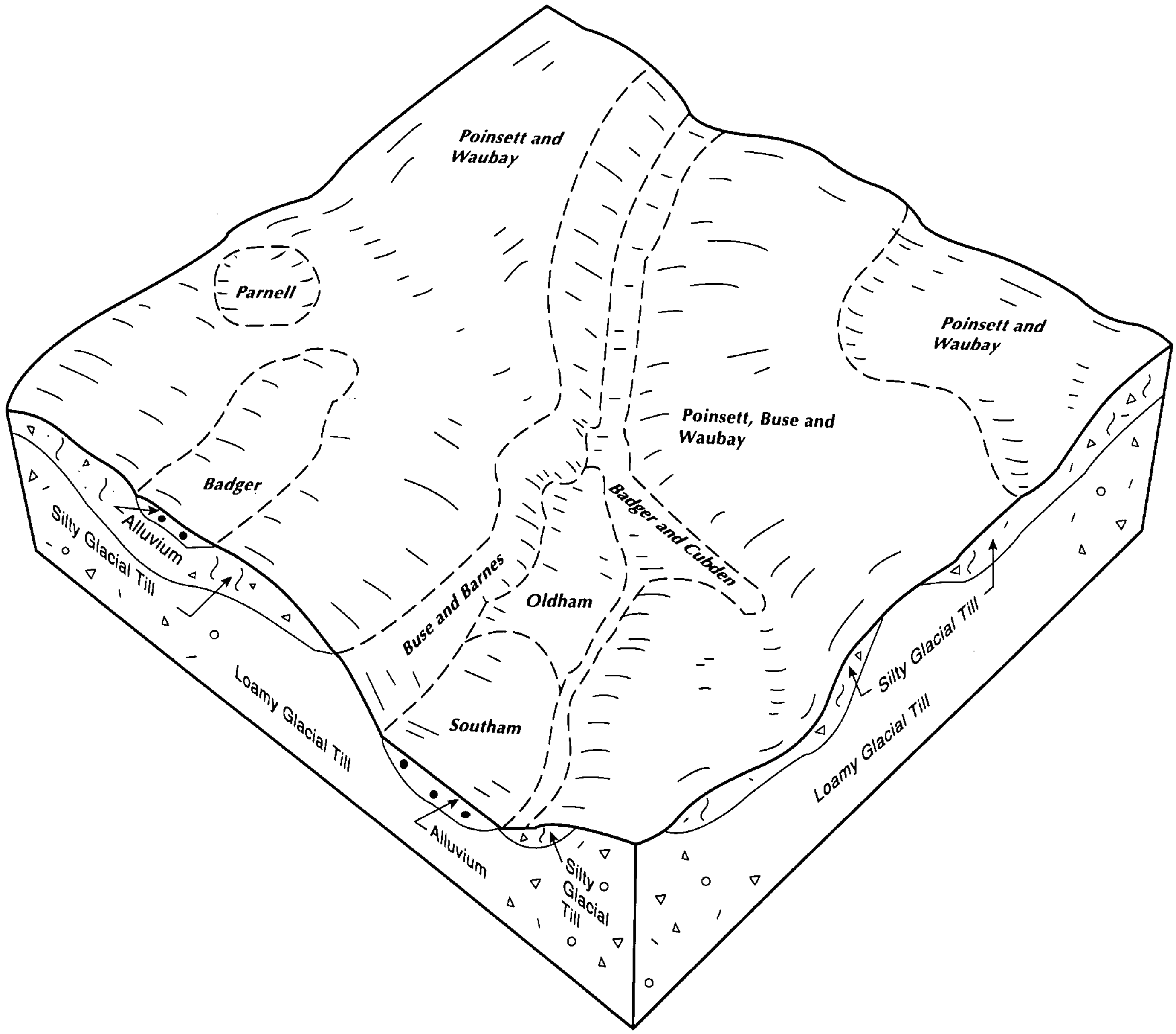

Figure 3.—Typical pattern of soils and underlying material in the Poinsett-Waubay-Buse association.

surface layer is dark gray, calcareous loam. The subsoil is pale brown, mottled, calcareous clay loam. The underlying material is pale brown and light brownish gray, mottled, calcareous clay loam.

Of minor extent in this association are Badger, Barnes, Cubden, Oldham, Parnell, and Southam soils. The somewhat poorly drained Badger soils are on toe slopes. The well drained Barnes soils contain more sand and less silt than the Poinsett and Waubay soils. They are on summits and back slopes. The somewhat poorly drained, calcareous Cubden soils are on foot slopes. The very poorly drained Oldham, Parnell, and Southam soils are in basins.

About 99 percent of this association is cropland. The main crops are corn, small grain, and soybeans. A few of the steeper areas are used as range. Controlling erosion is the main management concern.

2. Poinsett-Hetland Association

Well drained, nearly level to gently rolling, silty soils on till plains, moraines, and ice-walled lake plains

This association is characterized by nearly level to gently sloping ice-walled lake plains separated by steeper slopes and a few basins and drainageways. In most areas the drainage pattern is poorly defined, but it is well defined along the larger drainageways.

This association makes up about 4 percent of the county. It is about 40 percent Poinsett and similar soils, 25 percent Hetland soils, and 35 percent minor soils (fig. 4).

Poinsett soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is dark grayish brown, light olive brown, light yellowish brown, and light brownish gray silt loam. It is calcareous and mottled in the lower part. The underlying material is light brownish gray, mottled, calcareous silty clay loam and clay loam.

Hetland soils are on summits and back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silty clay loam. The upper part of the subsoil is dark grayish brown silty clay. The lower part is light brownish gray, mottled, calcareous silty clay. The underlying material is light gray, mottled, calcareous silty clay loam.

Of minor extent in this association are Barnes, Buse, Oldham, Parnell, Southam, and Waubay soils. The well drained Barnes soils contain more sand and less silt than the Poinsett and Hetland soils. They are on summits and back slopes. The well drained Buse soils are calcareous at or near the surface. They are on shoulder slopes. The very poorly drained Oldham, Parnell, and Southam soils are in basins. The moderately well drained Waubay soils are dark to a depth of more than 16 inches. They are on foot slopes.

About 99 percent of this association is cropland. The main crops are corn, small grain, and soybeans. Controlling erosion is the main management concern.

3. Vienna-Egeland Association

Well drained, nearly level to moderately sloping, silty and loamy soils on till plains, outwash plains, and moraines

This association is characterized by rises interrupted by a few small scattered basins. Slopes are dominantly nearly level and undulating. The drainage pattern is not well defined, but drainage flows toward Lake Thompson.

This association makes up about 1 percent of the county. It is about 35 percent Vienna soils, 30 percent Egeland and similar soils, and 35 percent minor soils.

Vienna soils are on summits and back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark grayish brown silt loam. The upper part of the subsoil is brown silty clay loam. The lower part is yellowish brown and pale brown, mottled, calcareous clay loam. The underlying material is pale brown, mottled, calcareous clay loam.

Egeland soils are on summits and back slopes. Slopes range from 2 to 9 percent. Typically, the surface layer is dark gray sandy loam. The upper part of the subsoil is grayish brown sandy loam. The lower part is light brownish gray, calcareous sandy loam. The underlying material is light brownish gray, calcareous loamy sand.

Of minor extent in this association are Brookings, Maddock, Oldham, Parnell, and Southam soils. Brookings soils are moderately well drained. The well drained Maddock soils are on shoulder slopes. The very poorly drained Oldham, Parnell, and Southam soils are in basins.

About 99 percent of this association is cropland. The main crops are alfalfa, corn, small grain, and soybeans. Some areas are used as range. Conserving moisture and controlling erosion are the main management concerns.

Dominantly Nearly Level to Strongly Sloping Soils That Are Excessively Drained to Poorly Drained

These soils dominantly are nearly level to undulating but are moderately sloping or strongly sloping in places. They make up about 8 percent of the county. About 55 percent of the acreage is cropland. Conserving moisture and controlling erosion are the main management concerns.

4. Renshaw-Sioux-Marysland Association

Somewhat excessively drained, excessively drained, and poorly drained, nearly level to strongly sloping, loamy soils on outwash plains, moraines, and flood plains

This association is in a band that runs northwest to southeast through the central part of the county. It is characterized by a few large sloughs and lakes. Slopes generally are level to undulating but are moderately sloping or strongly sloping in places. The drainage pattern is poorly defined, but drainage flows south toward Lake Henry and Lake Thompson.

This association makes up about 7 percent of the county. It is about 40 percent Renshaw and similar soils, 20 percent Sioux soils, 15 percent Marysland soils, and 25 percent minor soils.

The somewhat excessively drained Renshaw soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray

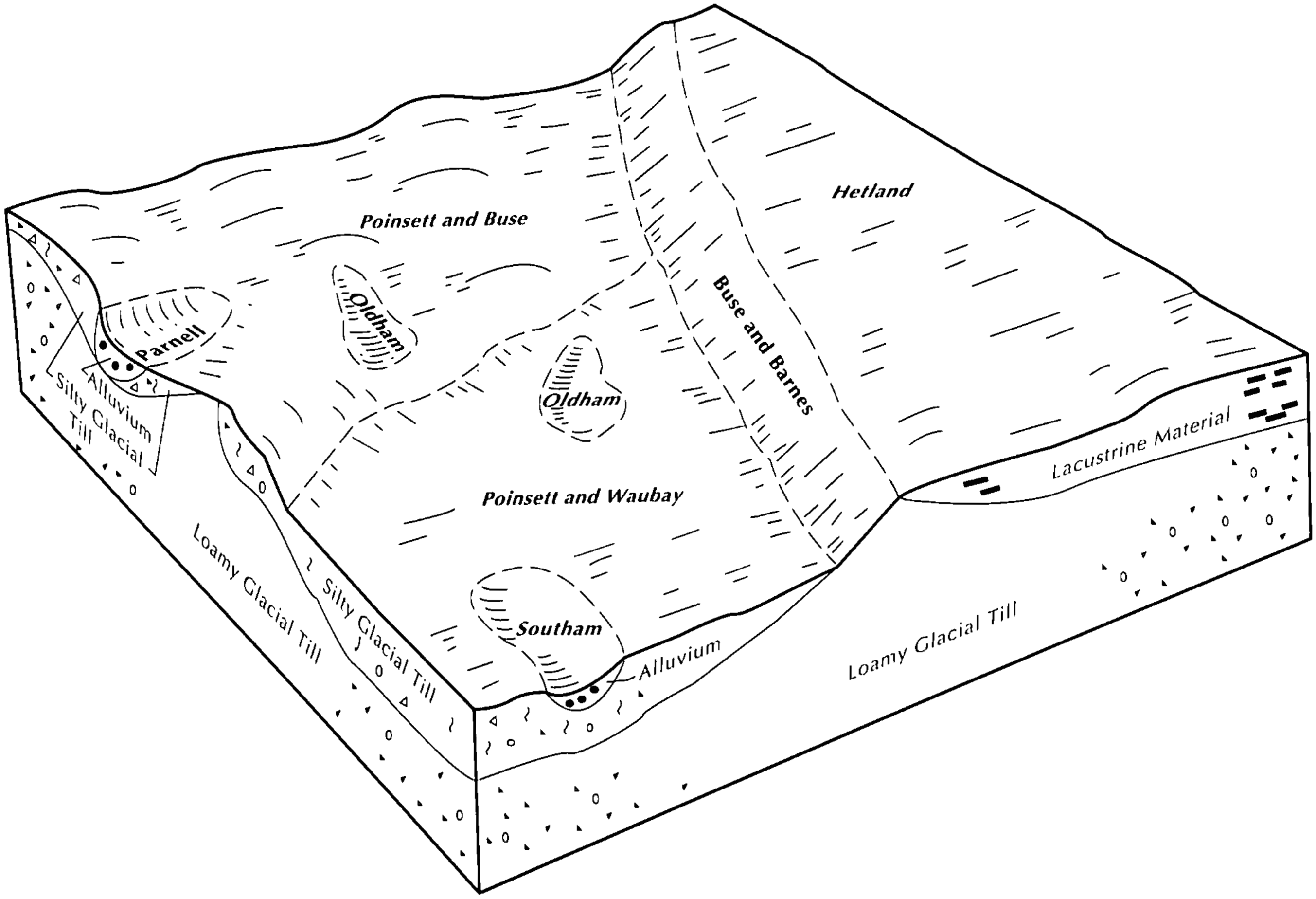

Figure 4.—Typical pattern of soils and underlying material in the Poinsett-Hetland association.

loam. The subsoil is dark grayish brown loam and brown gravelly loam. The underlying material is multicolored very gravelly loamy sand.

The excessively drained Sioux soils are on shoulder slopes. Slopes range from 2 to 15 percent. Typically, the surface layer is dark gray gravelly loam. Below this is a transitional layer of dark grayish brown, calcareous very gravelly loamy sand. The underlying material is multicolored very gravelly loamy sand.

The poorly drained Marysland soils are on low flood plains. Slopes are 0 to 1 percent. Typically, the surface soil is dark gray, calcareous loam. The subsoil is gray, calcareous clay loam. The upper part of the underlying material is light olive gray, mottled, calcareous clay loam. The lower part is light gray, mottled, calcareous gravelly loamy sand and olive gray, mottled, calcareous loamy sand.

Of minor extent in this association are Divide, Minnewasta, Minnewaukan, Oldham, and Southam soils. The somewhat poorly drained, calcareous Divide soils are on foot slopes. The somewhat poorly drained Minnewasta soils consist of sandy material over loamy glacial till. They are on toe slopes. The poorly drained Minnewaukan soils are sandy throughout. They are on toe slopes. The very poorly drained Oldham and Southam soils are in large basins.

About 50 percent of this association is cropland, and about 50 percent is range. Alfalfa, corn, and small grain are the main crops. Some areas are irrigated. Controlling erosion is the main management concern. Conserving moisture is a major concern in areas of the Renshaw and Sioux soils. Wetness is a concern on the Marysland soils. The Renshaw and Marysland soils are suited to cultivated crops. The Sioux soils generally are unsuited to cultivated crops because of the very low available water capacity and the hazard of erosion.

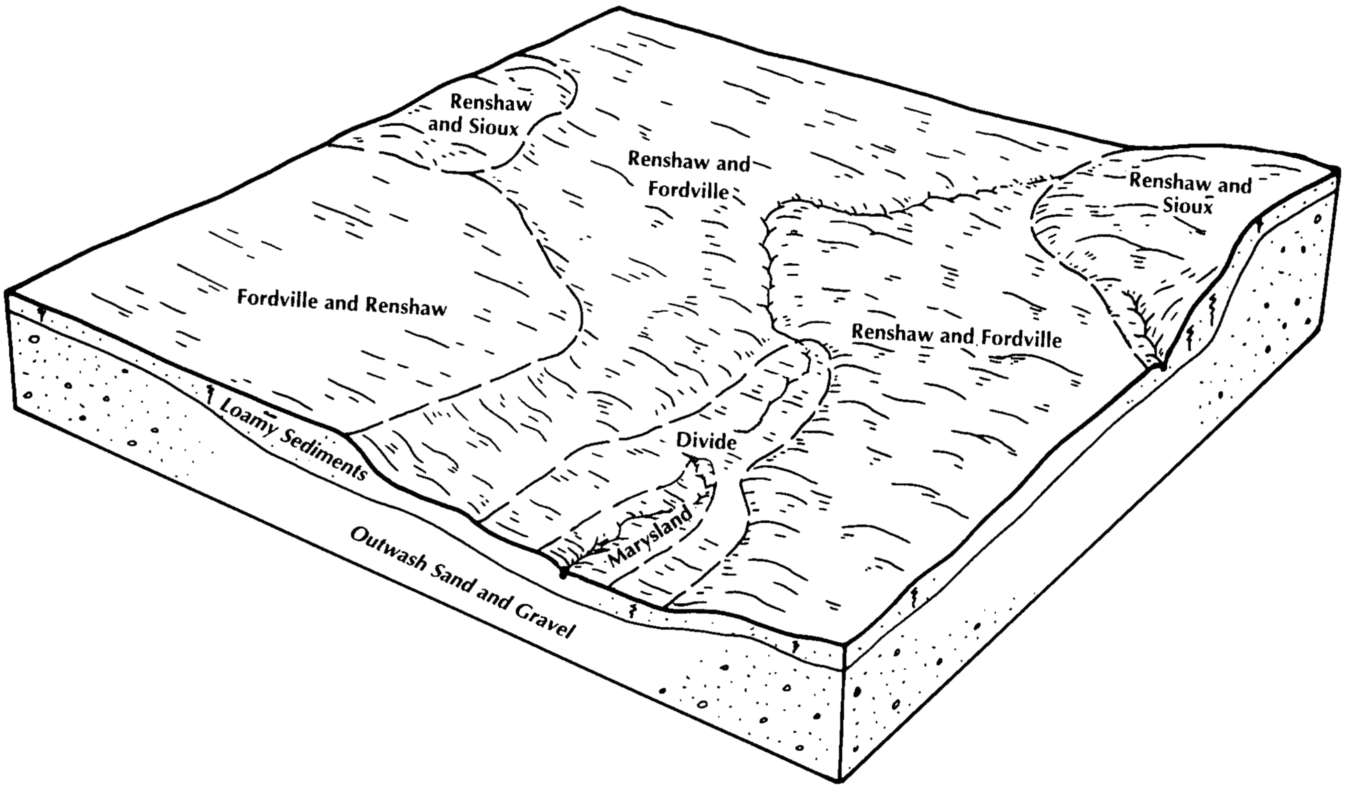

Figure 5.—Typical pattern of soils and underlying material in the Renshaw-Fordville association.

5. Renshaw-Fordville Association

Somewhat excessively drained and well drained, nearly level to gently rolling, loamy soils on outwash plains and moraines

This association is characterized by large flats and some areas that are more sloping. Slopes are smooth in the nearly level areas but are more complex in the sloping areas. The drainage pattern is poorly defined, and drainage flows south toward Spirit Lake.

This association makes up about 1 percent of the county. It is about 40 percent Renshaw and similar soils, 25 percent Fordville and similar soils, and 35 percent minor soils (fig. 5).

The somewhat excessively drained Renshaw soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray loam. The subsoil is dark grayish brown loam and brown gravelly loam. The underlying material is multicolored very gravelly loamy sand.

The well drained Fordville soils are on foot slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark brown and yellowish brown loam. The underlying material is multicolored gravelly loamy sand and gravelly sand.

Minor soils in this association are Barnes, Buse, Divide, Holmquist, La Prairie, Lowe, Marysland, Oldham, and Sioux soils. The well drained Barnes and Buse soils are not underlain by sand and gravel. Barnes soils are on summits and back slopes. Buse soils are calcareous at or near the surface. They are on shoulder slopes. The somewhat poorly drained, calcareous Divide soils are on foot slopes. The poorly drained Holmquist soils are on low flood plains. The moderately well drained La Prairie soils are on high flood plains. The poorly drained Lowe and Marysland soils are on low flood plains. The very poorly drained Oldham soils are in basins. The excessively drained Sioux soils have gravelly material within a depth of 14 inches. They are on shoulder slopes.

About 60 percent of this association is cropland. Alfalfa, corn, and small grain are the main crops. Conserving moisture and controlling erosion are the main management concerns in cultivated areas. Most areas of the Renshaw and Fordville soils are suited to cultivated crops, tame pasture, and hay, but both soils are droughty unless irrigated. Generally, the steeper

areas of the Renshaw soils are not suited to cultivated crops. Areas that were not previously cultivated support native vegetation and are used as range.

Dominantly Nearly Level to Moderately Steep Soils That Are Well Drained and Moderately Well Drained

These soils dominantly are nearly level to moderately sloping but are strongly sloping to moderately steep along some drainageways. They make up about 41 percent of the county. About 80 percent of the acreage is cropland, and the remaining acreage is range. Conserving moisture, controlling erosion, and maintaining tilth are the main management concerns.

6. Clarno-Bonilla-Ethan Association

Well drained and moderately well drained, nearly level to moderately steep, loamy soils on till plains and moraines

This association is characterized by rises interrupted by concave areas, basins, and shallow drainageways. Slopes mainly are nearly level to moderately sloping. In a few places they are strongly sloping to moderately steep. The drainage pattern is fairly well defined, and drainage flows mainly toward Redstone Creek.

This association makes up about 14 percent of the county. It is about 40 percent Clarno soils, 20 percent Bonilla soils, 15 percent Ethan soils, and 25 percent minor soils (fig. 6).

The well drained Clarno soils are on summits and back slopes. Slopes range mainly from 0 to 9 percent, but in a few places they range from 0 to 15 percent. Typically, the surface soil is dark gray loam. The subsoil is brown and pale brown loam. It is calcareous and mottled in the lower part. The underlying material is light brownish gray, mottled, calcareous clay loam.

The moderately well drained Bonilla soils are on foot slopes. Slopes range from 0 to 4 percent. Typically, the surface layer is dark gray loam. The upper part of the subsoil is dark grayish brown and dark gray loam, the next part is brown clay loam, and the lower part is pale brown, mottled, calcareous clay loam. The underlying material is light yellowish brown, mottled, calcareous loam.

The well drained Ethan soils are on shoulder slopes and back slopes. Slopes range from 2 to 20 percent. Typically, the surface layer is grayish brown, calcareous loam. The subsoil is light yellowish brown, calcareous clay loam. The underlying material is light yellowish brown, mottled, calcareous clay loam.

Of minor extent in this association are Bon, Crossplain, Stickney, Tetonka, and Worthing soils. The moderately well drained Bon soils are on high flood plains. The somewhat poorly drained Crossplain soils are on toe slopes. The moderately well drained Stickney soils have a sodium-affected subsoil. They are on foot slopes. The poorly drained Worthing soils are in basins.

About 85 percent of this association is cropland. The main crops are alfalfa, corn, small grain, and soybeans. Controlling erosion and conserving moisture are the main management concerns. A substantial acreage is used as range.

7. Houdek-Stickney-Dudley Association

Well drained and moderately well drained, nearly level to gently sloping, loamy and silty soils on till plains

This association is characterized by predominantly nearly level landscapes with many microbasins. The drainage pattern is poorly defined, and drainage terminates in many small basins.

This association makes up about 23 percent of the county. It is about 30 percent Houdek and similar soils, 20 percent Stickney and similar soils, 15 percent Dudley and similar soils, and 35 percent minor soils.

The well drained Houdek soils are on summits and back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark grayish brown loam. The upper part of the subsoil is dark grayish brown and brown clay loam. The lower part is light brownish gray, calcareous clay loam. The underlying material is pale brown and light yellowish brown, mottled, calcareous clay loam.

The moderately well drained Stickney soils are on summits and back slopes. Slopes range from 0 to 2 percent. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is brown loam. Below this is a transitional layer of brown loam. The upper part of the subsoil is brown clay loam. The lower part is very pale brown, calcareous clay loam. The underlying material is light gray, mottled, calcareous clay loam. It has nests of salts.

The moderately well drained Dudley soils are on foot slopes. Slopes range from 0 to 2 percent. Typically, the surface layer is gray silt loam. The subsurface layer is grayish brown silt loam. The upper part of the subsoil is dark gray clay loam. It has nests of salts below a depth of 17 inches. The lower part of the subsoil is light brownish gray, calcareous clay loam. The underlying material is light brownish gray, mottled, calcareous clay loam.

Of minor extent in this association are Bon, Ethan, Hoven, Jerauld, Tetonka, and Worthing soils. The moderately well drained Bon soils are on high flood plains. The well drained Ethan soils are calcareous at or near the surface. They are on shoulder slopes. The poorly drained Hoven and Tetonka soils and the very poorly drained Worthing soils are in basins. The somewhat poorly drained Jerauld soils have visible salts

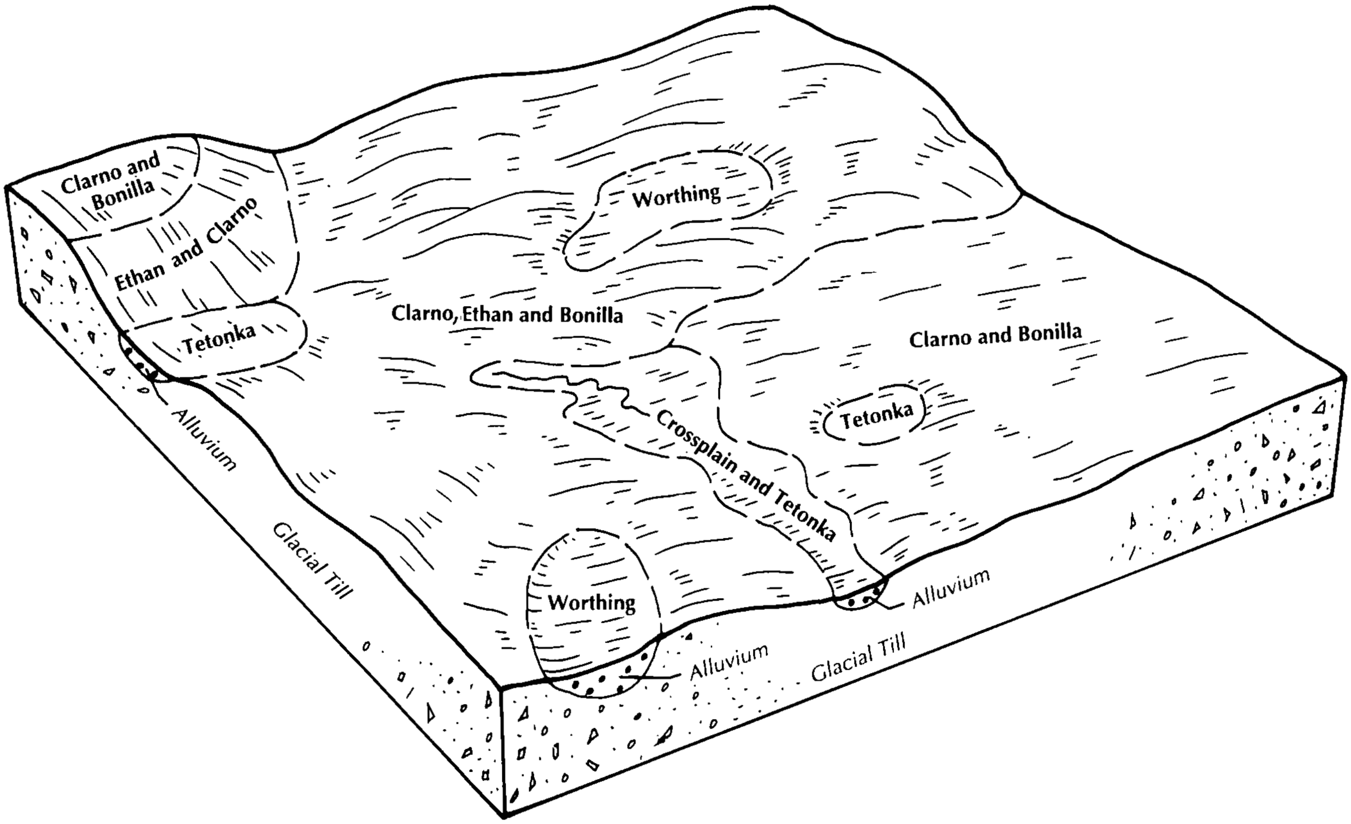

Figure 6.—Typical pattern of soils and underlying material in the Clarno-Bonilla-Ethan association.

within a depth of 16 inches. They are on the lower foot slopes.

About 70 percent of this association is cropland. The main crops are alfalfa, corn, small grain, soybeans, and sunflowers. Conserving moisture and maintaining tilth are the main management concerns in cultivated areas. Many areas of the association are used as range.

8. Clarno-Bon Association

Well drained and moderately well drained, nearly level to moderately sloping, loamy soils on till plains, moraines, and flood plains

This association is on narrow flood plains and adjacent till plains and moraines. The soils mainly are nearly level to moderately sloping, but they are strongly sloping in some areas adjacent to flood plains. In many areas the nearly level slopes on the flood plains are broken by drainage channels and meander scars.

This association makes up about 3 percent of the county. It is about 40 percent Clarno soils, 25 percent Bon soils, and 35 percent minor soils.

The well drained Clarno soils are on summits and back slopes. Slopes generally range from 0 to 9 percent, but in a few places they range from 0 to 15 percent. Typically, the surface soil is dark gray loam. The subsoil is brown and pale brown loam. It is calcareous and mottled in the lower part. The underlying material is light brownish gray, mottled, calcareous clay loam.

The moderately well drained Bon soils are on high flood plains. Slopes range from 0 to 2 percent. Typically, the surface layer is dark gray loam. The upper part of the subsoil also is dark gray loam. The lower part is gray and grayish brown, calcareous silt loam. Below this is a buried layer of dark gray, calcareous silt loam. The underlying material is grayish brown, mottled, calcareous clay loam.

Of minor extent in this association are Crossplain, Delmont, Ethan, and Tetonka soils. The somewhat poorly drained Crossplain soils are on toe slopes. The somewhat excessively drained Delmont soils are 14 to 20 inches deep to gravelly material. They are on summits and back slopes. The well drained Ethan soils

are calcareous at or near the surface. They are on shoulder slopes. The poorly drained Tetonka soils are in small basins.

About 60 percent of this association is cropland. The main crops are alfalfa, corn, small grain, and soybeans. The remaining acreage is mainly used as range. Conserving moisture is the main management concern.

9. Beadle-Dudley Association

Well drained and moderately well drained, nearly level to moderately sloping, loamy and silty soils on till plains and moraines

This association is characterized by nearly level and gently sloping soils, but a few areas are moderately sloping. The drainage pattern is poorly defined, and drainage terminates in many small basins.

This association makes up about 1 percent of the county. It is about 45 percent Beadle soils, 25 percent Dudley soils, and 30 percent minor soils.

The well drained Beadle soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The upper part of the subsoil is dark grayish brown clay loam. The lower part is grayish brown and light brownish gray, calcareous clay loam. It has mottles below a depth of 21 inches. The underlying material is grayish brown, mottled, calcareous clay loam.

The moderately well drained Dudley soils are on foot slopes. Slopes range from 0 to 2 percent. Typically, the surface layer is gray silt loam. The subsurface layer is grayish brown silt loam. The upper part of the subsoil is dark gray clay loam. It has nests of salts below a depth of 17 inches. The lower part of the subsoil is light brownish gray, calcareous clay loam. The underlying material is light brownish gray, mottled, calcareous clay loam.

Of minor extent in this association are Clarno, Durrstein, Ethan, Jerauld, and Stickney soils. Clarno soils are in landscape positions similar to those of the Beadle soils. They have less clay than the Beadle soils. The poorly drained Durrstein soils are on low flood plains. The well drained Ethan soils are calcareous at or near the surface. They are on shoulder slopes. The somewhat poorly drained Jerauld soils have visible salts within a depth of 16 inches. They are on the lower foot slopes. The moderately well drained Stickney soils are less affected by sodium in the subsoil than the Dudley soils. They are on summits and back slopes.

About 60 percent of this association is cropland. The main crops are alfalfa, corn, small grain, soybeans, and sunflowers. Many areas are used as range. Conserving moisture and maintaining tilth are the main management concerns in cultivated areas. Controlling erosion is a concern in the more sloping areas.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hetland silty clay loam, 0 to 2 percent slopes, is a phase of the Hetland series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Crossplain-Tetonka complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

Ba—Badger silty clay loam

Composition

Badger and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Toe slopes
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 20 to more than 100 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray silty clay loam
Subsoil:
9 to 35 inches—dark gray silty clay
35 to 46 inches—light brownish gray, mottled silty clay loam
Underlying layer:
46 to 55 inches—light brownish gray, mottled silty clay loam
55 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till

Seasonal high water table: At the surface to 3 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow

Inclusions

Contrasting inclusions:
- Cubden soils, which are calcareous at or near the surface; on foot slopes
- The very poorly drained Parnell and poorly drained Tonka soils in basins
- The moderately well drained Waubay soils, which have less clay and more silt in the subsoil than the Badger soil; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Wetness
Management measures:
- In wet years this soil is better suited to late planted crops than to other crops.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to maintain tilth and improve the rate of water infiltration.
- Delaying tillage when the soil is wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: IIw-1
Range site: Loamy Overflow
Windbreak suitability group: 2
Pasture suitability group: A

Bb—Baltic silty clay loam

Composition

Baltic and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 30 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray, calcareous silty clay loam
Subsoil:
10 to 21 inches—dark gray, calcareous silty clay loam that has nests of gypsum
21 to 36 inches—dark gray, calcareous silty clay that has nests of gypsum
36 to 45 inches—grayish brown, mottled, calcareous silty clay
45 to 60 inches—light brownish gray, mottled, calcareous silty clay

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow

Inclusions

Contrasting inclusions:
- The moderately well drained Bon soils on high flood plains
- Durrstein soils, which have a sodium-affected subsoil; in landscape positions similar to or slightly lower than those of the Baltic soil

Use and Management

Cropland

Suitability: Unsuited
Management concerns: Wetness
Management measures:
- Proper grazing management helps to maintain plant vigor.
- Deferring grazing or haying during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Vw-4
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

BcB—Barnes-Buse loams, 2 to 6 percent slopes

Composition

Barnes and similar soils: 55 to 65 percent

Buse and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Barnes—summits and back slopes; Buse—shoulder slopes
Slope range: Barnes—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Barnes

Surface layer:
0 to 7 inches—dark gray loam
Subsoil:
7 to 13 inches—dark brown clay loam
13 to 27 inches—grayish brown, mottled, calcareous clay loam
Underlying layer:
27 to 60 inches—light brownish gray, mottled, calcareous clay loam

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam
Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam
Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Barnes—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
• The very poorly drained Parnell soils in basins
Similar inclusions:
• Soils that have less sand between depths of 10 and 40 inches than the Barnes soil
• Soils that have more clay in the subsoil than the Barnes soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular to be farmed on the contour.
• Applying animal waste, especially on the Buse soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Barnes—IIe-2; Buse—IIIe-6
Range site: Barnes—Silty; Buse—Thin Upland
Windbreak suitability group: Barnes—3; Buse—8
Pasture suitability group: Barnes—F; Buse—G

BcC—Barnes-Buse loams, 6 to 9 percent slopes

Composition

Barnes and similar soils: 45 to 55 percent
Buse and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Barnes—back slopes; Buse—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 13 inches—dark brown clay loam
13 to 27 inches—grayish brown, mottled, calcareous clay loam

Underlying layer:
27 to 60 inches—light brownish gray, mottled, calcareous clay loam

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Barnes—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
• The very poorly drained Parnell soils in basins

Similar inclusions:
• Soils that have less sand between depths of 10 and 40 inches than the Barnes soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular for contour farming and terraces.
• Applying animal waste, especially on the Buse soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Barnes—IIIe-1; Buse—IVe-2
Range site: Barnes—Silty; Buse—Thin Upland
Windbreak suitability group: Barnes—3; Buse—8
Pasture suitability group: Barnes—F; Buse—G

BdA—Beadle loam, 0 to 2 percent slopes

Composition

Beadle and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Summits and back slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 17 inches—dark grayish brown clay loam
17 to 21 inches—grayish brown, calcareous clay loam
21 to 31 inches—light brownish gray, mottled, calcareous clay loam

Underlying layer:
31 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep

Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on back slopes
• The somewhat poorly drained Crossplain soils on foot slopes
• The moderately well drained Dudley soils, which have a sodium-affected subsoil; on foot slopes
• The poorly drained Tetonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, sorghum, sunflowers, and winter wheat
Management concerns: Slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and help to maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: IIs-1
Range site: Clayey
Windbreak suitability group: 4
Pasture suitability group: E

BdB—Beadle loam, 2 to 6 percent slopes

Composition

Beadle and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Summits and back slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 17 inches—dark grayish brown clay loam
17 to 21 inches—grayish brown, calcareous clay loam
21 to 31 inches—light brownish gray, mottled, calcareous clay loam

Underlying layer:
31 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The moderately well drained Dudley soils, which have a sodium-affected subsoil; on foot slopes
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on back slopes
• The poorly drained Hoven soils in basins

Similar inclusions:
• Soils that have less clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, sorghum, sunflowers, and winter wheat
Management concerns: Water erosion, slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture, help to control erosion, and maintain the content of organic matter and tilth.
• Contour farming and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular to be farmed on the contour.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIe-3
Range site: Clayey
Windbreak suitability group: 4
Pasture suitability group: E

BdC—Beadle loam, 6 to 9 percent slopes

Composition

Beadle and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Summits and back slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 17 inches—dark grayish brown clay loam
17 to 21 inches—grayish brown, calcareous clay loam
21 to 31 inches—light brownish gray, mottled, calcareous clay loam

Underlying layer:
31 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Rapid

Inclusions

Contrasting inclusions:
• The well drained Ethan soils, which are calcareous at or near the surface; on shoulder slopes
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on foot slopes

Similar inclusions:
• Soils that have less clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, sorghum, sunflowers, and winter wheat
Management concerns: Water erosion, slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture, help to control erosion, and maintain the content of organic matter and tilth.
• Contour farming, terraces, and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular for contour farming and terraces.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe-7
Range site: Clayey
Windbreak suitability group: 4
Pasture suitability group: E

BeA—Beadle-Dudley complex, 0 to 2 percent slopes

Composition

Beadle and similar soils: 50 to 60 percent
Dudley and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Beadle—summits and back slopes; Dudley—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to more than 100 acres

Typical Profile

Beadle

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 17 inches—dark grayish brown clay loam
17 to 21 inches—grayish brown, calcareous clay loam
21 to 31 inches—light brownish gray, mottled, calcareous clay loam

Underlying layer:
31 to 60 inches—grayish brown, mottled, calcareous clay loam

Dudley

Surface layer:
0 to 6 inches—gray silt loam

Subsurface layer:
6 to 9 inches—grayish brown silt loam

Subsoil:
9 to 17 inches—dark gray clay loam
17 to 21 inches—dark gray clay loam that has nests of salts
21 to 36 inches—light brownish gray, calcareous clay loam that has nests of salts

Underlying layer:
36 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Beadle—well drained; Dudley—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Beadle—at a depth of more than 6 feet; Dudley—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Beadle—slow; Dudley—very slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow
Other properties: The Dudley soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on back slopes
• The poorly drained Hoven soils in basins

Similar inclusions:
• Soils that have less clay in the subsoil than the Beadle soil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Beadle—slow rate of water infiltration; Dudley—slow rate of water infiltration and a sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and help to maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Beadle—IIs-1; Dudley—IVs-2
Range site: Beadle—Clayey; Dudley—Claypan
Windbreak suitability group: Beadle—4; Dudley—9
Pasture suitability group: Beadle—E; Dudley—C

Bn—Bon loam

Composition

Bon and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 14 inches—dark gray loam
14 to 20 inches—dark gray, calcareous loam
20 to 32 inches—gray, calcareous silt loam
32 to 50 inches—grayish brown, calcareous silt loam

Underlying layer:
50 to 56 inches—dark gray, calcareous silt loam
56 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of 3 to 5 feet
Flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The poorly drained Baltic soils on low flood plains
• Delmont soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Similar inclusions:
• Soils that have more carbonates in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Conserving moisture
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: IIc-1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Bo—Bon loam, channeled

Composition

Bon and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 20 to more than 100 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam
Subsoil:
8 to 14 inches—dark gray loam
14 to 20 inches—dark gray, calcareous loam
20 to 32 inches—gray, calcareous silt loam
32 to 50 inches—grayish brown, calcareous silt loam
Underlying layer:
50 to 56 inches—dark gray, calcareous silt loam
56 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of 3 to 5 feet
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Areas of this soil typically are dissected by meandering channels.

Inclusions

Contrasting inclusions:
• The poorly drained Baltic soils on low flood plains
• Delmont soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
Similar inclusions:
• Soils that have more carbonates in the subsoil

Use and Management

Rangeland

Management concerns: Wetness and the meandering channels, which restrict cultivation
Management measures:
• Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: VIw-1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: NS

BrB—Brandt silty clay loam, 2 to 6 percent slopes

Composition

Brandt and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Summits and back slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay loam
Subsoil:
8 to 17 inches—brown silt loam
17 to 23 inches—pale brown silt loam
23 to 34 inches—light yellowish brown, calcareous silty clay loam
34 to 41 inches—light yellowish brown, calcareous loam
Underlying layer:
41 to 60 inches—light yellowish brown, calcareous, stratified gravelly loamy sand and gravelly sandy loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to 60 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The moderately well drained Waubay soils, which do not have gravelly underlying material; on foot slopes
• Poinsett soils, which do not have gravelly underlying material; on summits and back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: IIe-3
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BuC—Buse-Barnes loams, 6 to 9 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Barnes and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Barnes—back slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 13 inches—dark brown clay loam
13 to 27 inches—grayish brown, mottled, calcareous clay loam

Underlying layer:
27 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Barnes—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Waubay soils, which are dark to a depth of more than 16 inches; on foot slopes

Similar inclusions:
• Soils that have less sand between depths of 10 and 40 inches than the Barnes soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular for contour farming and terraces.
• Applying animal waste, especially on the Buse soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Buse—IVe-2; Barnes—IIIe-1
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—8; Barnes—3
Pasture suitability group: Buse—G; Barnes—F

BuD—Buse-Barnes loams, 9 to 20 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Barnes and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Barnes—back slopes
Slope range: Buse—9 to 20 percent; Barnes—9 to 15 percent
Shape of areas: Irregular
Size of areas: 25 to 100 acres

Typical Profile

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 13 inches—dark brown clay loam
13 to 27 inches—grayish brown, mottled, calcareous clay loam

Underlying layer:
27 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Barnes—high
Surface runoff: Rapid
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
• The moderately well drained Holmquist soils along narrow channeled drainageways

Use and Management

Rangeland

Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIe-3; Barnes—IVe-1
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—10; Barnes—3
Pasture suitability group: Buse—NS; Barnes—F

BxD—Buse-Holmquist, channeled, loams, 0 to 20 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Holmquist and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines and flood plains
Landform position: Buse—shoulder slopes and back slopes; Holmquist—low flood plains
Slope range: Buse—3 to 20 percent; Holmquist—0 to 3 percent
Shape of areas: Long and narrow
Size of areas: 40 to more than 100 acres

Typical Profile

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam
Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam
Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Holmquist

Surface layer:
0 to 4 inches—dark gray, calcareous loam
Subsurface layer:
4 to 8 inches—very dark grayish brown, calcareous clay loam that has nests of salts
Transitional layer:
8 to 14 inches—very dark grayish brown and grayish brown, calcareous clay loam interbedded with silty clay loam
Underlying layer:
14 to 40 inches—gray and light brownish gray, calcareous silty clay loam and loam; mottled in the lower part
40 to 60 inches—gray, mottled, stratified, calcareous loamy sand and clay loam

Soil Properties and Qualities

Drainage class: Buse—well drained; Holmquist—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Buse—at a depth of more than 6 feet; Holmquist—at a depth of 0.5 foot to 1.5 feet
Flooding: Buse—none; Holmquist—frequent for brief periods
Ponding: None
Permeability: Buse—moderately slow; Holmquist—moderate
Available water capacity: High
Organic matter content: Buse—moderately low; Holmquist—moderate
Surface runoff: Buse—rapid; Holmquist—very slow
Other properties: The Buse soil has a high content of lime. Areas of the Holmquist soil typically are dissected by meandering channels.

Inclusions

Contrasting inclusions:
• The well drained Barnes soils, which are calcareous below a depth of 10 inches; on back slopes
• Lamoure soils, which have less salt than the Holmquist soil; in landscape positions similar to those of the Holmquist soil
• The moderately well drained La Prairie soils, which are not stratified within a depth of 10 inches; in positions on the landscape slightly higher than those of the Holmquist soil

Use and Management

Rangeland

Management concerns: Buse—wind erosion and water erosion; Holmquist—wetness, meandering channels
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIe-3; Holmquist—VIw-1
Range site: Buse—Thin Upland; Holmquist—Saline Subirrigated
Windbreak suitability group: Buse—8; Holmquist—10
Pasture suitability group: Buse—G; Holmquist—NS

CbA—Clarno-Bonilla loams, 0 to 2 percent slopes

Composition

Clarno and similar soils: 50 to 70 percent

Bonilla and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Clarno—summits and back slopes; Bonilla—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Typical Profile

Clarno

Surface soil:
0 to 12 inches—dark gray loam

Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam

Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Bonilla

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 16 inches—dark grayish brown loam
16 to 21 inches—dark gray loam
21 to 25 inches—brown clay loam
25 to 30 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
30 to 60 inches—light yellowish brown, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Clarno—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Clarno—at a depth of more than 6 feet; Bonilla—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Clarno—moderate; Bonilla—high
Surface runoff: Slow
Other properties: Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The calcareous Ethan soils on shoulder slopes
• The poorly drained Tetonka soils in basins
• The somewhat poorly drained Crossplain soils on toe slopes
• Stickney soils, which have a subsoil that is only slightly affected by sodium; in positions on the landscape similar to those of the Bonilla soil

Similar inclusions:
• Soils that have more clay in the subsoil than the Clarno and Bonilla soils

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, and winter wheat
Management concerns: Conserving moisture
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Clarno—IIc-2; Bonilla—IIc-3
Range site: Clarno—Silty; Bonilla—Loamy Overflow
Windbreak suitability group: Clarno—3; Bonilla—1
Pasture suitability group: Clarno—F; Bonilla—K

CbB—Clarno-Bonilla loams, 1 to 6 percent slopes

Composition

Clarno and similar soils: 60 to 70 percent
Bonilla and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Clarno—summits and back slopes; Bonilla—foot slopes
Slope range: Clarno—2 to 6 percent; Bonilla—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to more than 100 acres

Typical Profile

Clarno

Surface soil:
0 to 12 inches—dark gray loam

Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam

Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Bonilla

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 16 inches—dark grayish brown loam
16 to 21 inches—dark gray loam
21 to 25 inches—brown clay loam
25 to 30 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
30 to 60 inches—light yellowish brown, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Clarno—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Clarno—at a depth of more than 6 feet; Bonilla—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Clarno—moderate; Bonilla—high
Surface runoff: Clarno—medium; Bonilla—slow
Other properties: Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The calcareous Ethan soils on shoulder slopes
• The poorly drained Tetonka soils in basins
• The somewhat poorly drained Crossplain soils on toe slopes

Similar inclusions:
• Soils that have more clay in the subsoil than the Clarno and Bonilla soils

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, and winter wheat
Management concerns: Clarno—water erosion; Bonilla—conserving moisture
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Clarno—IIe-2; Bonilla—IIc-3
Range site: Clarno—Silty; Bonilla—Loamy Overflow
Windbreak suitability group: Clarno—3; Bonilla—1
Pasture suitability group: Clarno—F; Bonilla—K

CeB—Clarno-Ethan-Bonilla loams, 1 to 6 percent slopes

Composition

Clarno and similar soils: 40 to 50 percent
Ethan and similar soils: 25 to 35 percent
Bonilla and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Clarno—summits and back slopes; Ethan—shoulder slopes; Bonilla—foot slopes
Slope range: Clarno—2 to 6 percent; Ethan—2 to 6 percent; Bonilla—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to more than 200 acres

Typical Profile

Clarno

Surface soil:
0 to 12 inches—dark gray loam

Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam

Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam

Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Bonilla

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 16 inches—dark grayish brown loam
16 to 21 inches—dark gray loam

21 to 25 inches—brown clay loam
25 to 30 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
30 to 60 inches—light yellowish brown, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Clarno—well drained; Ethan—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Clarno—at a depth of more than 6 feet; Ethan—at a depth of more than 6 feet; Bonilla—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Clarno—moderate; Ethan—moderately low; Bonilla—high
Surface runoff: Clarno—medium; Ethan—medium; Bonilla—slow
Other properties: The Ethan soil has a high content of lime. Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Crossplain soils on toe slopes
• The poorly drained Tetonka soils in basins

Similar inclusions:
• Soils that have more clay in the subsoil than the Clarno soil
• Soils that have a thinner surface layer than the Ethan soil
• Soils that have more clay in the subsoil than the Bonilla soil

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, and winter wheat
Management concerns: Clarno—water erosion; Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Bonilla—conserving moisture
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular to be farmed on the contour.
• Applying animal waste, especially on the Ethan soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Clarno—IIe-2; Ethan—IIIe-12; Bonilla—IIc-3
Range site: Clarno—Silty; Ethan—Thin Upland; Bonilla—Loamy Overflow
Windbreak suitability group: Clarno—3; Ethan—8; Bonilla—1
Pasture suitability group: Clarno—F; Ethan—G; Bonilla—K

CeC—Clarno-Ethan-Bonilla loams, 2 to 9 percent slopes

Composition

Clarno and similar soils: 35 to 55 percent
Ethan and similar soils: 25 to 35 percent
Bonilla and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Clarno—back slopes; Ethan—shoulder slopes; Bonilla—foot slopes
Slope range: Clarno—6 to 9 percent; Ethan—6 to 9 percent; Bonilla—2 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Clarno

Surface soil:
0 to 12 inches—dark gray loam

Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam

Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam

Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Bonilla

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 16 inches—dark grayish brown loam
16 to 21 inches—dark gray loam
21 to 25 inches—brown clay loam
25 to 30 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
30 to 60 inches—light yellowish brown, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Clarno—well drained; Ethan—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Clarno—at a depth of more than 6 feet; Ethan—at a depth of more than 6 feet; Bonilla—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Clarno—moderate; Ethan—moderately low; Bonilla—high
Surface runoff: Medium
Other properties: The Ethan soil has a high content of lime. Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Crossplain soils on toe slopes
- The poorly drained Tetonka soils in basins

Similar inclusions:
- Soils that have more clay in the subsoil than the Clarno soil
- Soils that have a thinner surface layer than the Ethan soil
- Soils that have more clay in the subsoil than the Bonilla soil

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, and winter wheat
Management concerns: Clarno—water erosion; Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Bonilla—conserving moisture
Management measures:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular for contour farming and terraces.
- Applying animal waste, especially on the Ethan soil, helps to maintain fertility.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Clarno—IIIe-2; Ethan—IVe-3; Bonilla—IIe-3
Range site: Clarno—Silty; Ethan—Thin Upland; Bonilla—Silty
Windbreak suitability group: Clarno—3; Ethan—8; Bonilla—1
Pasture suitability group: Clarno—F; Ethan—G; Bonilla—K

Ct—Crossplain-Tetonka complex

Composition

Crossplain and similar soils: 50 to 70 percent
Tetonka and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Crossplain—toe slopes; Tetonka—basins
Slope range: Crossplain—0 to 2 percent; Tetonka—0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to more than 100 acres

Typical Profile

Crossplain

Surface layer:
0 to 10 inches—dark gray clay loam

Transitional layer:
10 to 14 inches—dark gray clay loam

Subsoil:
14 to 25 inches—dark gray clay loam
25 to 35 inches—light brownish gray, mottled, clay loam
35 to 53 inches—light gray, mottled, calcareous clay loam

Underlying layer:
53 to 60 inches—light gray, mottled, calcareous clay loam

Tetonka

Surface layer:
0 to 10 inches—dark gray silt loam

Subsurface layer:
10 to 21 inches—gray, mottled loam

Subsoil:
21 to 31 inches—gray clay loam
31 to 40 inches—grayish brown clay loam
40 to 48 inches—light brownish gray, mottled clay loam

Underlying layer:
48 to 54 inches—light olive gray, mottled, calcareous clay loam
54 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Crossplain—somewhat poorly drained; Tetonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Crossplain—at the surface to 2 feet below the surface; Tetonka—1 foot above to 1 foot below the surface
Flooding: Crossplain—frequent for brief periods; Tetonka—none
Ponding: Crossplain—none; Tetonka—frequent for long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Crossplain—very slow; Tetonka—negligible

Inclusions

Contrasting inclusions:
• The moderately well drained Prosper soils on foot slopes
• The moderately well drained Davison soils, which are calcareous at or near the surface; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, sunflowers, and winter wheat
Management concerns: Wetness, soil compaction if tilled when wet
Management measures:
• In most years these soils are better suited to late planted crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface and including grasses and legumes in the cropping system help to maintain tilth and improve the rate of water infiltration.
• Delaying field work when the soils are wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Crossplain—IIw-1; Tetonka—IVw-1
Range site: Crossplain—Loamy Overflow; Tetonka—Wet Meadow
Windbreak suitability group: Crossplain—2; Tetonka—10
Pasture suitability group: Crossplain—A; Tetonka—B2

Cu—Cubden silty clay loam

Composition

Cubden and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray, calcareous silty clay loam

Subsoil:
10 to 28 inches—pale brown, calcareous silty clay loam

Underlying layer:
28 to 41 inches—light yellowish brown, mottled, calcareous silty clay loam
41 to 60 inches—grayish brown and light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Seasonal high water table: At a depth of 1.5 to 3.5 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Badger soils, which are calcareous below a depth of 35 inches; on toe slopes
• The well drained Buse soils on shoulder slopes
• The well drained Poinsett soils, which are calcareous at a greater depth than the Cubden soil; on back slopes
• The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; wind erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: IIs-4
Range site: Limy Subirrigated
Windbreak suitability group: 1
Pasture suitability group: F

Cv—Cubden-Badger silty clay loams

Composition

Cubden and similar soils: 40 to 50 percent
Badger and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Cubden—foot slopes; Badger—toe slopes
Slope range: Cubden—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 200 acres

Typical Profile

Cubden

Surface layer:
0 to 10 inches—dark gray, calcareous silty clay loam
Subsoil:
10 to 28 inches—pale brown, calcareous silty clay loam
Underlying layer:
28 to 41 inches—light yellowish brown, mottled, calcareous silty clay loam
41 to 60 inches—grayish brown and light brownish gray, mottled, calcareous clay loam

Badger

Surface layer:
0 to 9 inches—dark gray silty clay loam
Subsoil:
9 to 35 inches—dark gray silty clay
35 to 46 inches—light brownish gray, mottled silty clay loam
Underlying layer:
46 to 55 inches—light brownish gray, mottled silty clay loam
55 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Cubden—40 to more than 60 inches over loamy glacial till; Badger—40 to more than 60 inches over glacial till
Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Badger—at the surface to 3.0 feet below the surface
Flooding: Cubden—none; Badger—frequent for brief periods
Ponding: None
Permeability: Cubden—moderate; Badger—slow
Available water capacity: High
Organic matter content: Cubden—moderate; Badger—high
Surface runoff: Cubden—slow; Badger—very slow
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Waubay soils on foot slopes
• The well drained Poinsett soils, which are calcareous below a depth of 10 inches; on back slopes
• The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Cubden—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Badger—wetness

Management measures:
• In wet years these soils are better suited to late planted crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Deferred tillage when the Badger soil is wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Cubden—IIs-4; Badger—IIw-1
Range site: Cubden—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: Cubden—1; Badger—2
Pasture suitability group: Cubden—F; Badger—A

Cw—Cubden-Tonka silty clay loams

Composition

Cubden and similar soils: 50 to 70 percent
Tonka and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Cubden—foot slopes; Tonka—basins
Slope range: Cubden—0 to 2 percent; Tonka—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Cubden

Surface layer:
0 to 10 inches—dark gray, calcareous silty clay loam
Subsoil:
10 to 28 inches—pale brown, calcareous silty clay loam
Underlying layer:
28 to 41 inches—light yellowish brown, mottled, calcareous silty clay loam
41 to 60 inches—grayish brown and light brownish gray, mottled, calcareous clay loam

Tonka

Surface layer:
0 to 7 inches—dark gray silty clay loam
Subsurface layer:
7 to 13 inches—dark gray silty clay loam
13 to 19 inches—gray, mottled silt loam
Subsoil:
19 to 30 inches—very dark gray silty clay
30 to 40 inches—dark gray silty clay
40 to 51 inches—grayish brown, mottled silty clay loam
Underlying layer:
51 to 60 inches—light brownish gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Cubden—somewhat poorly drained; Tonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Cubden—40 to more than 60 inches over loamy glacial till; Tonka—greater than 60 inches
Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Tonka—0.5 foot above to 1.0 foot below the surface
Flooding: None
Ponding: Cubden—none; Tonka—frequent for long periods
Permeability: Cubden—moderate; Tonka—slow
Available water capacity: High
Organic matter content: Cubden—moderate; Tonka—high
Surface runoff: Cubden—slow; Tonka—negligible
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils, which are calcareous at a greater depth than the Cubden soil; on toe slopes
• The very poorly drained Parnell soils in the deeper basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Cubden—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Tonka—wetness
Management measures:
• In wet years these soils are better suited to late planted crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water on the Tonka soil.
• Deferred tillage during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Cubden—IIs-4; Tonka—IVw-2
Range site: Cubden—Limy Subirrigated; Tonka—Wet Meadow
Windbreak suitability group: Cubden—1; Tonka—10
Pasture suitability group: Cubden—F; Tonka—B2

Dc—Davison-Crossplain complex

Composition

Davison and similar soils: 40 to 50 percent
Crossplain and similar soils: 35 to 55 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Davison—foot slopes; Crossplain—toe slopes
Slope range: Davison—0 to 2 percent; Crossplain—0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Davison

Surface layer:
0 to 8 inches—dark grayish brown, calcareous loam

Subsoil:
8 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 34 inches—light yellowish brown, calcareous loam
34 to 60 inches—pale yellow and light yellowish brown, mottled, calcareous loam

Crossplain

Surface layer:
0 to 10 inches—dark gray clay loam

Transitional layer:
10 to 14 inches—dark gray clay loam

Subsoil:
14 to 25 inches—dark gray clay loam
25 to 35 inches—light brownish gray, mottled clay loam
35 to 53 inches—light gray, mottled, calcareous clay loam

Underlying layer:
53 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Davison—moderately well drained; Crossplain—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Davison—at a depth of 1.5 to 4.0 feet; Crossplain—at the surface to 2 feet below the surface
Flooding: Davison—none; Crossplain—frequent for brief periods
Ponding: None
Permeability: Davison—moderately slow; Crossplain—slow
Available water capacity: High
Organic matter content: Davison—moderate; Crossplain—high
Surface runoff: Davison—slow; Crossplain—very slow
Other properties: The Davison soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla soils, which are not calcareous in the upper layers; on foot slopes
• The well drained Clarno soils on back slopes
• The poorly drained Tetonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, sunflowers, and winter wheat
Management concerns: Davison—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Crossplain—wetness
Management measures:
• In wet years these soils are better suited to late planted crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Deferred tillage on the Crossplain soil during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Davison—IIe-4; Crossplain—IIw-1
Range site: Davison—Limy Subirrigated; Crossplain—Loamy Overflow
Windbreak suitability group: Davison—1; Crossplain—2
Pasture suitability group: Davison—F; Crossplain—A

DeA—Delmont loam, 0 to 2 percent slopes

Composition

Delmont and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Summits and back slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 18 inches—dark grayish brown loam

Underlying layer:
18 to 45 inches—grayish brown, calcareous very gravelly loamy sand
45 to 60 inches—light yellowish brown, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 14 to 20 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Organic matter content: Moderate
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• Clarno soils, which do not have gravelly underlying material; in landscape positions similar to those of the Delmont soil
• The excessively drained Talmo soils on shoulder slopes

Similar inclusions:
• Soils that are deeper to gravelly material

Use and Management

Cropland

Main crops: Alfalfa, oats, spring wheat, and winter wheat
Management concerns: Low available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to maintain the content of organic matter.

Interpretive Groups

Land capability classification: IVs-1
Range site: Shallow to Gravel
Windbreak suitability group: 6
Pasture suitability group: D2

DtB—Delmont-Talmo loams, 2 to 6 percent slopes

Composition

Delmont and similar soils: 50 to 60 percent
Talmo and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Delmont—summits and back slopes; Talmo—shoulder slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Delmont

Surface layer:
0 to 9 inches—dark gray loam

Subsoil:
9 to 18 inches—dark grayish brown loam

Underlying layer:
18 to 45 inches—grayish brown, calcareous very gravelly loamy sand
45 to 60 inches—light yellowish brown, calcareous gravelly loamy sand

Talmo

Surface layer:
0 to 7 inches—dark gray loam

Underlying layer:
7 to 60 inches—grayish brown, calcareous extremely gravelly loamy sand

Soil Properties and Qualities

Drainage class: Delmont—somewhat excessively drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Delmont—14 to 20 inches

over gravelly material; Talmo—6 to 14 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Delmont—moderate in the loamy sediments and very rapid in the underlying gravelly material; Talmo—very rapid
Available water capacity: Delmont—low; Talmo—very low
Organic matter content: Delmont—moderate; Talmo—moderately low
Surface runoff: Delmont—medium; Talmo—very slow

Inclusions

Contrasting inclusions:
• Clarno soils, which do not have gravelly underlying material; in positions on the landscape similar to those of the Delmont soil

Similar inclusions:
• Soils that are deeper to gravelly material than the Delmont soil

Use and Management

Cropland

Main crops: Alfalfa, oats, spring wheat, and winter wheat
Management concerns: Delmont—low available water capacity, water erosion; Talmo—very low available water capacity, water erosion
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.

Interpretive Groups

Land capability classification: Delmont—IVe-6; Talmo—VIs-4
Range site: Delmont—Shallow to Gravel; Talmo—Very Shallow
Windbreak suitability group: Delmont—6; Talmo—10
Pasture suitability group: Delmont—D2; Talmo—NS

Dv—Divide loam

Composition

Divide and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Foot slopes
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray, calcareous loam

Subsoil:
10 to 21 inches—light gray, calcareous loam
21 to 26 inches—light brownish gray, calcareous loam

Underlying layer:
26 to 41 inches—light brownish gray and pale brown, calcareous gravelly loamy sand
41 to 60 inches—very pale brown and light yellowish brown, mottled, calcareous loamy fine sand and loamy sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Seasonal high water table: At a depth of 1.5 to 3.5 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: Moderate
Surface runoff: Slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Renshaw soils in the higher positions on the landscape
• The excessively drained Sioux soils on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; moderate available water capacity; and wind erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.

• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: IIIs-4
Range site: Limy Subirrigated
Windbreak suitability group: 1
Pasture suitability group: D1

Dx—Dudley-Jerauld silt loams

Composition

Dudley and similar soils: 50 to 70 percent
Jerauld and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Dudley—summits and back slopes; Jerauld—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 25 to more than 200 acres

Typical Profile

Dudley

Surface layer:
0 to 6 inches—gray silt loam

Subsurface layer:
6 to 9 inches—grayish brown silt loam

Subsoil:
9 to 17 inches—dark gray clay loam
17 to 21 inches—dark gray clay loam that has nests of salts
21 to 36 inches—light brownish gray, calcareous clay loam that has nests of salts

Underlying layer:
36 to 60 inches—light brownish gray, mottled, calcareous clay loam

Jerauld

Surface layer:
0 to 2 inches—grayish brown silt loam

Subsoil:
2 to 14 inches—dark gray clay loam
14 to 30 inches—grayish brown, calcareous clay loam that has nests of salts

Underlying layer:
30 to 50 inches—light brownish gray, mottled, calcareous clay loam
50 to 60 inches—light olive gray, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Very slow
Available water capacity: Dudley—high; Jerauld—moderate
Organic matter content: Moderate
Surface runoff: Slow
Other properties: Both soils have a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Crossplain soils on toe slopes
• The well drained Houdek soils, which do not have a sodium-affected subsoil; on summits and back slopes
• The moderately well drained Stickney soils, which have less sodium in the subsoil than the major soils; on summits and back slopes
• The poorly drained Hoven soils in basins

Use and Management

Cropland

Main crops: Dudley—alfalfa, spring wheat, sorghum, sunflowers, and winter wheat; Jerauld—generally unsuited to crops
Management concerns: The sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots; a slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Dudley—IVs-2; Jerauld—VIs-1
Range site: Dudley—Claypan; Jerauld—Thin Claypan
Windbreak suitability group: Dudley—9; Jerauld—10
Pasture suitability group: Dudley—C; Jerauld—NS

Dy—Durrstein silt loam

Composition

Durrstein and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 20 to 150 acres

Typical Profile

Surface layer:
0 to 2 inches—gray silt loam

Subsoil:
2 to 12 inches—dark gray silty clay
12 to 19 inches—dark gray, calcareous silty clay that has nests of salts
19 to 34 inches—light brownish gray, calcareous clay loam that has nests of salts
34 to 45 inches—light brownish gray, mottled, calcareous clay loam that has nests of salts

Underlying layer:
45 to 60 inches—olive gray, calcareous sandy loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over sandy material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Very slow
Available water capacity: Moderate
Organic matter content: Moderate
Surface runoff: Very slow
Other properties: This soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• Baltic soils, which do not have a sodium-affected subsoil; in positions on the landscape similar to those of the Durrstein soil

Use and Management

Rangeland

Management concerns: Wetness, slow rate of water infiltration

Management measures:
• Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: VIs-6
Range site: Saline Lowland
Windbreak suitability group: 10
Pasture suitability group: J

EgA—Egeland-Embden complex, 0 to 2 percent slopes

Composition

Egeland and similar soils: 40 to 60 percent
Embden and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Egeland—summits and back slopes; Embden—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Egeland

Surface layer:
0 to 9 inches—dark gray sandy loam

Subsoil:
9 to 16 inches—grayish brown sandy loam
16 to 35 inches—light brownish gray, calcareous sandy loam

Underlying layer:
35 to 60 inches—light brownish gray, calcareous loamy sand that has thin lenses of sand and sandy loam

Embden

Surface soil:
0 to 17 inches—very dark gray fine sandy loam

Subsoil:
17 to 29 inches—very dark gray sandy loam
29 to 36 inches—dark grayish brown sandy loam
36 to 52 inches—pale brown, calcareous sandy loam

Underlying layer:
52 to 60 inches—pale brown, calcareous sandy loam

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egeland—40 to more than 60 inches over glacial till; Embden—40 to more than

60 inches over finer or coarser material
Seasonal high water table: Egeland—at a depth of more than 6 feet; Embden—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Organic matter content: Egeland—moderate; Embden—high
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• Vienna soils, which have a thin silty mantle overlying glacial till; in positions on the landscape similar to those of the Egeland soil

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Wind erosion, moderate available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.

Interpretive Groups

Land capability classification: Egeland—IIIs-1; Embden—IIs-5
Range site: Egeland—Sandy; Embden—Sandy
Windbreak suitability group: Egeland—5; Embden—1
Pasture suitability group: Egeland—H; Embden—H

EgB—Egeland-Embden complex, 2 to 6 percent slopes

Composition

Egeland and similar soils: 60 to 80 percent
Embden and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Egeland—summits and back slopes; Embden—foot slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to more than 100 acres

Typical Profile

Egeland

Surface layer:
0 to 9 inches—dark gray sandy loam
Subsoil:
9 to 16 inches—grayish brown sandy loam
16 to 35 inches—light brownish gray, calcareous sandy loam
Underlying layer:
35 to 60 inches—light brownish gray, calcareous loamy sand that has thin lenses of sand and sandy loam

Embden

Surface soil:
0 to 17 inches—very dark gray fine sandy loam
Subsoil:
17 to 29 inches—very dark gray sandy loam
29 to 36 inches—dark grayish brown sandy loam
36 to 52 inches—pale brown, calcareous sandy loam
Underlying layer:
52 to 60 inches—pale brown, calcareous sandy loam

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egeland—40 to more than 60 inches over glacial till; Embden—40 to more than 60 inches over finer or coarser material
Seasonal high water table: Egeland—at a depth of more than 6 feet; Embden—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Organic matter content: Egeland—moderate; Embden—high
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Vienna soils, which have a thin silty mantle overlying glacial till; in positions on the landscape similar to those of the Egeland soil
• Maddock soils, which have more sand than the major soils; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Wind erosion, water erosion, the moderate available water capacity

Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.

Interpretive Groups

Land capability classification: Egeland—IIIe-7; Embden—IIIe-7
Range site: Egeland—Sandy; Embden—Sandy
Windbreak suitability group: Egeland—5; Embden—1
Pasture suitability group: Egeland—H; Embden—H

EmC—Egeland-Maddock sandy loams, 6 to 9 percent slopes

Composition

Egeland and similar soils: 60 to 80 percent
Maddock and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Egeland—summits and back slopes; Maddock—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to more than 80 acres

Typical Profile

Egeland

Surface layer:
0 to 9 inches—dark gray sandy loam

Subsoil:
9 to 16 inches—grayish brown sandy loam
16 to 35 inches—light brownish gray, calcareous sandy loam

Underlying layer:
35 to 60 inches—light brownish gray, calcareous loamy sand that has thin lenses of sand and sandy loam

Maddock

Surface layer:
0 to 9 inches—very dark gray sandy loam

Subsoil:
9 to 14 inches—dark brown loamy fine sand

Underlying layer:
14 to 34 inches—brown and yellowish brown loamy fine sand
34 to 60 inches—pale brown, mottled loamy fine sand

Soil Properties and Qualities

Drainage class: Egeland—well drained; Maddock—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egeland—40 to more than 60 inches over glacial till; Maddock—40 to more than 60 inches over loamy material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Egeland—moderately rapid; Maddock—rapid
Available water capacity: Egeland—moderate; Maddock—low
Organic matter content: Egeland—moderate; Maddock—moderately low
Surface runoff: Egeland—medium; Maddock—slow

Inclusions

Contrasting inclusions:
• Vienna soils, which have a thin silty mantle overlying glacial till; in positions on the landscape similar to those of the Egeland soil
• The well drained Embden soils, which are dark to a depth of more than 16 inches; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Egeland—wind erosion, water erosion, the moderate available water capacity; Maddock—wind erosion, water erosion, the low available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.

Interpretive Groups

Land capability classification: Egeland—IVe-3; Maddock—IVe-3
Range site: Egeland—Sandy; Maddock—Sandy
Windbreak suitability group: Egeland—5; Maddock—5

Pasture suitability group: Egeland—H; Maddock—H

EnD—Ethan-Betts loams, 9 to 20 percent slopes

Composition

Ethan and similar soils: 40 to 60 percent
Betts and similar soils: 25 to 35 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines
Landform position: Ethan—back slopes; Betts—shoulder slopes
Slope range: 9 to 20 percent
Shape of areas: Irregular
Size of areas: 25 to 200 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam

Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Betts

Surface layer:
0 to 4 inches—grayish brown, calcareous loam

Subsoil:
4 to 8 inches—light brownish gray, calcareous clay loam
8 to 15 inches—light brownish gray, mottled, calcareous clay loam
15 to 31 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
31 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Ethan—moderately low; Betts—low
Surface runoff: Ethan—rapid; Betts—rapid
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla soils on foot slopes
• The well drained Clarno soils, which are calcareous below a depth of 10 inches; on back slopes
• The somewhat poorly drained Crossplain soils on toe slopes

Use and Management

Rangeland

Management concerns: Wind erosion, water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—VIe-3; Betts—VIe-3
Range site: Ethan—Thin Upland; Betts—Thin Upland
Windbreak suitability group: Ethan—8; Betts—8
Pasture suitability group: Ethan—G; Betts—G

EoD—Ethan-Bon, channeled, loams, 0 to 20 percent slopes

Composition

Ethan and similar soils: 40 to 50 percent
Bon and similar soils: 30 to 40 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Moraines and flood plains
Landform position: Ethan—shoulder slopes and back slopes; Bon—low flood plains
Slope range: Ethan—2 to 20 percent; Bon—0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 20 to more than 100 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam

Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Bon

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 14 inches—dark gray loam
14 to 20 inches—dark gray, calcareous loam
20 to 32 inches—gray, calcareous silt loam
32 to 50 inches—grayish brown, calcareous silt loam

Underlying layer:
50 to 56 inches—dark gray, calcareous silt loam
56 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Ethan—well drained; Bon—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Ethan—at a depth of more than 6 feet; Bon—at a depth of 3 to 5 feet
Flooding: Ethan—none; Bon—frequent for brief periods
Ponding: None
Permeability: Ethan—moderately slow; Bon—moderate
Available water capacity: High
Organic matter content: Ethan—moderately low; Bon—high
Surface runoff: Ethan—rapid; Bon—slow
Other properties: The Ethan soil has a high content of lime. Areas of the Bon soil typically are dissected by meandering channels.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla soils on foot slopes
• The well drained Clarno soils, which are calcareous below a depth of 10 inches; on back slopes
• The somewhat poorly drained Crossplain soils on toe slopes

Similar inclusions:
• Soils that have a thinner surface layer than the Ethan soil

Use and Management

Rangeland

Management concerns: Ethan—wind erosion and water erosion; Bon—wetness and the meandering channels, which limit cultivation
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—VIe-3; Bon—VIw-1
Range site: Ethan—Thin Upland; Bon—Loamy Overflow
Windbreak suitability group: Ethan—8; Bon—1
Pasture suitability group: Ethan—G; Bon—NS

EtC—Ethan-Clarno loams, 6 to 9 percent slopes

Composition

Ethan and similar soils: 45 to 55 percent
Clarno and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Ethan—shoulder slopes; Clarno—back slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to more than 100 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam

Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Clarno

Surface soil:
0 to 12 inches—dark gray loam

Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam

Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow

Available water capacity: High
Organic matter content: Ethan—moderately low; Clarno—moderate
Surface runoff: Medium
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
- Bonilla soils, which are dark to a depth of more than 20 inches; on foot slopes
- The somewhat poorly drained Crossplain soils on toe slopes

Similar inclusions:
- Soils that have more clay in the subsoil than the Clarno soil
- Soils that have a thinner surface layer than the Ethan soil

Use and Management

Cropland

Main crops: Alfalfa, corn, soybeans, spring wheat, and winter wheat
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Clarno—water erosion
Management measures:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular for contour farming and terraces.
- Applying animal waste, especially on the Ethan soil, helps to maintain fertility.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Ethan—IVe-3; Clarno—IIIe-2
Range site: Ethan—Thin Upland; Clarno—Silty
Windbreak suitability group: Ethan—8; Clarno—3
Pasture suitability group: Ethan—G; Clarno—F

EtD—Ethan-Clarno loams, 9 to 15 percent slopes

Composition

Ethan and similar soils: 50 to 60 percent
Clarno and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Ethan—shoulder slopes; Clarno—back slopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—grayish brown, calcareous loam
Subsoil:
8 to 16 inches—light yellowish brown, calcareous loam
16 to 24 inches—light yellowish brown, mottled, calcareous loam
Underlying layer:
24 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Clarno

Surface soil:
0 to 12 inches—dark gray loam
Subsoil:
12 to 25 inches—brown loam
25 to 41 inches—pale brown, mottled, calcareous loam
Underlying layer:
41 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Ethan—moderately low; Clarno—moderate
Surface runoff: Rapid
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
- Bonilla soils, which are dark to a depth of more than 20 inches; on foot slopes
- The somewhat poorly drained Crossplain soils on toe slopes

Similar inclusions:
• Soils that have more clay in the subsoil than the Clarno soil
• Soils that have a thinner surface layer than the Ethan soil

Use and Management

Cropland or rangeland

Suitability: Generally unsuited to crops
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Clarno—water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—VIe-3; Clarno—IVe-1
Range site: Ethan—Thin Upland; Clarno—Silty
Windbreak suitability group: Ethan—8; Clarno—3
Pasture suitability group: Ethan—G; Clarno—F

HbB—Henkin-Blendon fine sandy loams, 2 to 6 percent slopes

Composition

Henkin and similar soils: 60 to 70 percent
Blendon and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Henkin—summits and back slopes; Blendon—foot slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Henkin

Surface layer:
0 to 8 inches—very dark grayish brown fine sandy loam
Subsoil:
8 to 26 inches—brown sandy loam
26 to 44 inches—light yellowish brown, calcareous sandy loam
Underlying layer:
44 to 60 inches—light yellowish brown, calcareous loamy fine sand

Blendon

Surface layer:
0 to 8 inches—very dark grayish brown fine sandy loam
Subsoil:
8 to 22 inches—dark grayish brown sandy loam
Underlying layer:
22 to 42 inches—brown sandy loam
42 to 60 inches—yellowish brown, calcareous loamy fine sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Henkin—40 to more than 60 inches over glacial till or gravelly material; Blendon—40 to more than 60 inches over glacial till
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Organic matter content: Moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Delmont soils, which have gravelly material at a depth of 14 to 20 inches; in positions on the landscape similar to those of the Henkin soil

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, and winter wheat
Management concerns: Wind erosion, water erosion, the moderate available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Henkin—IIIe-8; Blendon—IIIe-8
Range site: Henkin—Sandy; Blendon—Sandy
Windbreak suitability group: Henkin—5; Blendon—5
Pasture suitability group: Henkin—H; Blendon—H

HeA—Hetland silty clay loam, 0 to 2 percent slopes

Composition

Hetland and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains
Landform position: Summits
Slope range: 0 to 2 percent
Shape of areas: Oval
Size of areas: 10 to 150 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay loam
Subsoil:
8 to 23 inches—dark grayish brown silty clay
23 to 41 inches—light brownish gray, mottled, calcareous silty clay
Underlying layer:
41 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• Poinsett soils, which have less clay in the subsoil; in positions on the landscape similar to those of the Hetland soil
• The moderately well drained Waubay soils, which have less clay in the subsoil than the Hetland soil; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns:
• Only slight limitations affect cropland management.
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: I-2
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

HeB—Hetland silty clay loam, 2 to 6 percent slopes

Composition

Hetland and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains
Landform position: Summits and back slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay loam
Subsoil:
8 to 23 inches—dark grayish brown silty clay
23 to 41 inches—light brownish gray, mottled, calcareous silty clay
Underlying layer:
41 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Poinsett soils, which have less clay in the subsoil than the Hetland soil; on back slopes
• The moderately well drained Waubay soils, which have less clay in the subsoil than the Hetland soil; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: IIe-3
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

HpA—Houdek-Prosper loams, 0 to 2 percent slopes

Composition

Houdek and similar soils: 50 to 60 percent
Prosper and similar soils: 25 to 35 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Houdek—summits and back slopes; Prosper—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Houdek

Surface layer:
0 to 8 inches—dark grayish brown loam
Subsoil:
8 to 14 inches—dark grayish brown clay loam
14 to 18 inches—brown clay loam
18 to 38 inches—light brownish gray, calcareous loam
Underlying layer:
38 to 48 inches—pale brown, mottled, calcareous clay loam
48 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Prosper

Surface soil:
0 to 13 inches—dark grayish brown loam
Subsoil:
13 to 23 inches—very dark grayish brown clay loam
23 to 38 inches—grayish brown, calcareous clay loam
Underlying layer:
38 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Houdek—well drained; Prosper—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Houdek—at a depth of more than 6 feet; Prosper—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Houdek—moderate; Prosper—high
Surface runoff: Slow
Other properties: Runoff water flows over the Prosper soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on foot slopes
• The poorly drained Tetonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Conserving moisture
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Houdek—IIc-2; Prosper—IIc-3
Range site: Houdek—Silty; Prosper—Loamy Overflow
Windbreak suitability group: Houdek—3; Prosper—1
Pasture suitability group: Houdek—F; Prosper—K

HpB—Houdek-Prosper loams, 1 to 6 percent slopes

Composition

Houdek and similar soils: 60 to 80 percent
Prosper and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Houdek—summits and back slopes; Prosper—foot slopes
Slope range: Houdek—2 to 6 percent; Prosper—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Houdek

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 14 inches—dark grayish brown clay loam
14 to 18 inches—brown clay loam
18 to 38 inches—light brownish gray, calcareous loam

Underlying layer:
38 to 48 inches—pale brown, mottled, calcareous clay loam
48 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Prosper

Surface soil:
0 to 13 inches—dark grayish brown loam

Subsoil:
13 to 23 inches—very dark grayish brown clay loam
23 to 38 inches—grayish brown, calcareous clay loam

Underlying layer:
38 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Houdek—well drained; Prosper—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Houdek—at a depth of more than 6 feet; Prosper—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Houdek—moderate; Prosper—high
Surface runoff: Houdek—medium; Prosper—slow
Other properties: Runoff water flows over the Prosper soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Ethan soils, which are calcareous at or near the surface; on shoulder slopes
• The moderately well drained Stickney soils, which have a subsoil that is only slightly affected by sodium; on foot slopes
• The poorly drained Tetonka soils in basins

Similar inclusions:
• Soils that have less clay or more clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in most areas the slopes are too short or too irregular to be farmed on the contour.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Houdek—IIe-2; Prosper—IIc-3
Range site: Houdek—Silty; Prosper—Loamy Overflow
Windbreak suitability group: Houdek—3; Prosper—1
Pasture suitability group: Houdek—F; Prosper—K

HsA—Houdek-Stickney complex, 0 to 2 percent slopes

Composition

Houdek and similar soils: 40 to 60 percent
Stickney and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Houdek—summits and back slopes; Stickney—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to more than 200 acres

Typical Profile

Houdek

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 14 inches—dark grayish brown clay loam
14 to 18 inches—brown clay loam

18 to 38 inches—light brownish gray, calcareous loam

Underlying layer:

38 to 48 inches—pale brown, mottled, calcareous clay loam

48 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Stickney

Surface layer:

0 to 6 inches—dark grayish brown silt loam

Subsurface layer:

6 to 10 inches—brown loam

Transitional layer:

10 to 11 inches—brown clay loam

Subsoil:

11 to 20 inches—brown clay loam

20 to 35 inches—very pale brown, calcareous clay loam

Underlying layer:

35 to 60 inches—light gray, mottled, calcareous clay loam that has nests of salts

Soil Properties and Qualities

Drainage class: Houdek—well drained; Stickney—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Greater than 60 inches

Seasonal high water table: Houdek—at a depth of more than 6 feet; Stickney—at a depth of 3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Houdek—moderately slow; Stickney—slow

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Slow

Other properties: The Stickney soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:

• Dudley soils, which have a subsoil more adversely affected by sodium than that of the Stickney soil; on the lower foot slopes

• The poorly drained Tetonka soils in basins

• The somewhat poorly drained Crossplain soils, which do not have a sodium-affected subsoil; on toe slopes

Similar inclusions:

• Soils that have less clay or more clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat

Management concerns: Houdek—only slight limitations affecting cropland management; Stickney—a sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots, and a slow rate of water infiltration

Management measures:

• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain the content of organic matter and tilth.

• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Houdek—IIc-2; Stickney—IIIs-1

Range site: Houdek—Silty; Stickney—Clayey

Windbreak suitability group: Houdek—3; Stickney—4

Pasture suitability group: Houdek—F; Stickney—E

HsB—Houdek-Stickney complex, 2 to 6 percent slopes

Composition

Houdek and similar soils: 50 to 60 percent

Stickney and similar soils: 30 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Houdek—summits and back slopes; Stickney—foot slopes

Slope range: Houdek—2 to 6 percent; Stickney—2 to 3 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Houdek

Surface layer:

0 to 8 inches—dark grayish brown loam

Subsoil:

8 to 14 inches—dark grayish brown clay loam

14 to 18 inches—brown clay loam

18 to 38 inches—light brownish gray, calcareous loam

Underlying layer:

38 to 48 inches—pale brown, mottled, calcareous clay loam

48 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Stickney

Surface layer:

0 to 6 inches—dark grayish brown silt loam

Subsurface layer:
6 to 10 inches—brown loam
Transitional layer:
10 to 11 inches—brown clay loam
Subsoil:
11 to 20 inches—brown clay loam
20 to 35 inches—very pale brown, calcareous clay loam
Underlying layer:
35 to 60 inches—light gray, mottled, calcareous clay loam that has nests of salts

Soil Properties and Qualities

Drainage class: Houdek—well drained; Stickney—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Houdek—at a depth of more than 6 feet; Stickney—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Houdek—moderately slow; Stickney—slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Medium
Other properties: The Stickney soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The moderately well drained Prosper soils, which do not have a sodium-affected subsoil; on foot slopes
• The well drained Ethan soils, which are calcareous at or near the surface; on shoulder slopes
• The moderately well drained Dudley soils, which have more sodium in the subsoil than the Stickney soil; in positions on the landscape similar to those of the Stickney soil
• The poorly drained Tetonka soils in basins
Similar inclusions:
• Soils that have less clay or more clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Houdek—water erosion; Stickney—a sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots, and a slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Houdek—IIe-2; Stickney—IIIe-15
Range site: Houdek—Silty; Stickney—Clayey
Windbreak suitability group: Houdek—3; Stickney—4
Pasture suitability group: Houdek—F; Stickney—E

Ht—Houdek-Stickney-Tetonka complex

Composition

Houdek and similar soils: 40 to 50 percent
Stickney and similar soils: 20 to 30 percent
Tetonka and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Houdek—summits and back slopes; Stickney—foot slopes; Tetonka—basins
Slope range: Houdek—0 to 3 percent; Stickney—0 to 3 percent; Tetonka—0 to 1 percent
Shape of areas: Irregular
Size of areas: 25 to more than 200 acres

Typical Profile

Houdek

Surface layer:
0 to 8 inches—dark grayish brown loam
Subsoil:
8 to 14 inches—dark grayish brown clay loam
14 to 18 inches—brown clay loam
18 to 38 inches—light brownish gray, calcareous loam
Underlying layer:
38 to 48 inches—pale brown, mottled, calcareous clay loam
48 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Stickney

Surface layer:
0 to 6 inches—dark grayish brown silt loam
Subsurface layer:
6 to 10 inches—brown loam
Transitional layer:
10 to 11 inches—brown clay loam
Subsoil:
11 to 20 inches—brown clay loam
20 to 35 inches—very pale brown, calcareous clay loam

Underlying layer:
35 to 60 inches—light gray, mottled, calcareous clay loam that has nests of salts

Tetonka

Surface layer:
0 to 10 inches—dark gray silt loam

Subsurface layer:
10 to 21 inches—gray, mottled loam

Subsoil:
21 to 31 inches—gray clay loam
31 to 40 inches—grayish brown clay loam
40 to 48 inches—light brownish gray, mottled clay loam

Underlying layer:
48 to 54 inches—light olive gray, mottled, calcareous clay loam
54 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Houdek—well drained; Stickney—moderately well drained; Tetonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Houdek—at a depth of more than 6 feet; Stickney—at a depth of 3.5 to 5.0 feet; Tetonka—1 foot above to 1 foot below the surface
Flooding: None
Ponding: Houdek—none; Stickney—none; Tetonka—frequent for long periods
Permeability: Houdek—moderately slow; Stickney—slow; Tetonka—slow
Available water capacity: High
Organic matter content: Houdek—moderate; Stickney—moderate; Tetonka—high
Surface runoff: Houdek—slow; Stickney—slow; Tetonka—negligible
Other properties: The Stickney soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Crossplain soils on toe slopes
• The moderately well drained Davison soils, which are calcareous at or near the surface; on foot slopes
• The moderately well drained Dudley soils, which have a sodium-affected subsoil; on the lower foot slopes
• The well drained Ethan soils, which are calcareous at or near the surface; on shoulder slopes

Similar inclusions:
• Soils that have less clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, sorghum, spring wheat, sunflowers, and winter wheat
Management concerns: Houdek—conserving moisture; Stickney—a sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots, and a slow rate of water infiltration; Tetonka—wetness
Management measures:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.
• Maintaining existing drainage systems helps to remove excess water on the Tetonka soil.
• Deferred tillage during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Houdek—IIc-2; Stickney—IIIs-1; Tetonka—IVw-1
Range site: Houdek—Silty; Stickney—Clayey; Tetonka—Wet Meadow
Windbreak suitability group: Houdek—3; Stickney—4; Tetonka—10
Pasture suitability group: Houdek—F; Stickney—E; Tetonka—B2

Hv—Hoven silt loam

Composition

Hoven and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 15 acres

Typical Profile

Surface layer:
0 to 2 inches—gray silt loam

Subsoil:
2 to 5 inches—dark gray, mottled silty clay
5 to 32 inches—very dark gray silty clay that has nests of gypsum and other salts in the lower part
32 to 40 inches—grayish brown, calcareous silty clay loam that has nests of gypsum and other salts

Underlying layer:
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 1.0 foot above to 1.5 feet below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Very slow
Available water capacity: Moderate
Organic matter content: Moderate
Surface runoff: Negligible
Other properties: This soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• Tetonka soils, which have a thicker surface layer than the Hoven soil and do not have a sodium-affected subsoil; in the deeper part of basins

Use and Management

Rangeland

Management concerns: The sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots; a slow rate of water infiltration; and wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: VIs-6
Range site: Closed Depression
Windbreak suitability group: 10
Pasture suitability group: B2

Lh—La Prairie-Holmquist loams, channeled

Composition

La Prairie and similar soils: 45 to 55 percent
Holmquist and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: La Prairie—high flood plains; Holmquist—low flood plains
Slope range: La Prairie—0 to 2 percent; Holmquist—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 20 to 100 acres

Typical Profile

La Prairie

Surface soil:
0 to 14 inches—dark gray loam

Subsoil:
14 to 26 inches—dark gray, calcareous loam

Underlying layer:
26 to 42 inches—gray and grayish brown, calcareous loam and clay loam
42 to 60 inches—light brownish gray and grayish brown, calcareous, stratified loam and clay loam; mottles in the lower part

Holmquist

Surface layer:
0 to 4 inches—dark gray, calcareous loam

Subsurface layer:
4 to 8 inches—very dark grayish brown, calcareous clay loam that has nests of salts

Transitional layer:
8 to 14 inches—very dark grayish brown and grayish brown, calcareous clay loam interbedded with silty clay loam

Underlying layer:
14 to 40 inches—gray and light brownish gray, calcareous silty clay loam and calcareous loam; mottled in the lower part
40 to 60 inches—gray, mottled, stratified, calcareous loamy sand and clay loam

Soil Properties and Qualities

Drainage class: La Prairie—moderately well drained; Holmquist—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: La Prairie—40 to more than 60 inches over clayey or sandy material; Holmquist—greater than 60 inches
Seasonal high water table: La Prairie—at a depth of 3.5 to 5.0 feet; Holmquist—at a depth of 0.5 foot to 1.5 feet
Flooding: La Prairie—occasional for brief periods; Holmquist—frequent for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: La Prairie—high; Holmquist—moderate
Surface runoff: La Prairie—slow; Holmquist—very slow
Other properties: Areas of these soils typically are dissected by meandering stream channels.

Inclusions

Contrasting inclusions:
• Lamoure soils, which have less salt than the Holmquist soil; in positions on the landscape similar to those of the Holmquist soil

Similar inclusions:
• Soils that have less sand between depths of 10 and 40 inches than the La Prairie soil

Use and Management

Rangeland

Management concerns: Wetness and the meandering channels, which limit the use of machinery
Management measures:
• Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: La Prairie—VIw-1; Holmquist—VIw-1
Range site: La Prairie—Loamy Overflow; Holmquist—Saline Subirrigated
Windbreak suitability group: La Prairie—1; Holmquist—10
Pasture suitability group: La Prairie—NS; Holmquist—NS

Lm—Lamoure silty clay loam

Composition

Lamoure and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray, calcareous silty clay loam

Subsurface layer:
7 to 25 inches—very dark gray and dark gray, calcareous silty clay loam

Underlying layer:
25 to 60 inches—light gray and gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over sandy or gravelly material
Seasonal high water table: At the surface to 2 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Playmoor soils, which have more salts in the surface layer and subsoil than the Lamoure soil; on low flood plains
• Holmquist soils, which are stratified; on narrow low flood plains

Similar inclusions:
• Soils that have more carbonates in the subsoil
• Soils that have more clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years this soil is better suited to late planted crops than to other crops.
• Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IIIw-2
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Lo—Lowe loam

Composition

Lowe and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to more than 50 acres

Typical Profile

Surface layer:
0 to 4 inches—dark gray, calcareous loam

Subsurface layer:
4 to 12 inches—dark gray, calcareous clay loam

Subsoil:
12 to 23 inches—dark gray, calcareous clay loam
23 to 35 inches—gray, calcareous clay loam
35 to 50 inches—grayish brown, mottled, calcareous clay loam

Underlying layer:
50 to 60 inches—dark gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over gravelly material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Oldham soils, which have more clay between depths of 10 and 40 inches than the Lowe soil; in basins

Similar inclusions:
• Soils that have fewer carbonates in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years this soil is better suited to late planted crops than to other crops.
• Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-3
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Ma—Marysland loam

Composition

Marysland and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to more than 100 acres

Typical Profile

Surface soil:
0 to 12 inches—dark gray, calcareous loam

Subsoil:
12 to 30 inches—gray, calcareous clay loam

Underlying layer:
30 to 36 inches—light olive gray, mottled, calcareous clay loam
36 to 60 inches—light gray and olive gray, mottled, calcareous gravelly loamy sand and loamy sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Very slow

Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Divide soils on foot slopes
• Lamoure and Lowe soils, which do not have sandy or gravelly material within a depth of 40 inches; on low flood plains

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat (where drained)
Management concerns: Wetness, wind erosion, the moderate available water capacity, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In most years this soil is better suited to late planted crops than to other crops.
• Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-3
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: B1

MeA—Minnewasta sandy loam, 0 to 2 percent slopes

Composition

Minnewasta and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Beach terraces
Landform position: Toe slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 300 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray sandy loam

Underlying layer:
5 to 13 inches—grayish brown, mottled, calcareous loamy sand
13 to 60 inches—light brownish gray, mottled, calcareous clay loam and clay

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 10 to 20 inches over glacial till
Seasonal high water table: At the surface to 3.5 feet below the surface
Flooding: None
Ponding: Rare for long or very long periods
Permeability: Rapid in the sandy sediments and slow in the underlying glacial till
Available water capacity: Moderate
Organic matter content: Moderately low
Surface runoff: Slow
Other properties: Ponding occurs in a cyclic pattern, in which the soil may be ponded for several years and then may not be ponded again for many years.

Inclusions

Contrasting inclusions:
• Minnewaukan soils, which are sandy throughout; in the slightly higher positions on the landscape
• The very poorly drained Oldham and Southam soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion
Management measures:
• In wet years this soil is better suited to late planted crops than to other crops.
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion and maintain the content of organic matter.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: IVw-1
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Mw—Minnewaukan loamy sand

Composition

Minnewaukan and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Beach terraces
Landform position: Toe slopes
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 10 to more than 25 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray, calcareous loamy sand

Underlying layer:
6 to 19 inches—grayish brown and dark grayish brown, calcareous loamy sand
19 to 60 inches—grayish brown, light brownish gray, and light yellowish brown, calcareous sand and gravelly coarse sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy material
Seasonal high water table: 0.5 foot above to 1.5 feet below the surface
Flooding: Occasional for long periods
Ponding: None
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low
Surface runoff: Very slow
Other properties: Ponding occurs in a cyclic pattern, in which the soil may be ponded for several years and then may not be ponded again for many years.

Inclusions

Contrasting inclusions:
• The very poorly drained Oldham and Southam soils in basins

Use and Management

Cropland

Main crops: Alfalfa
Management concerns: Wetness, wind erosion
Management measures:
• This soil is better suited to early planted crops, such as small grain, than to other crops.
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: IVw-1
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Od—Oldham silty clay loam

Composition

Oldham and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to more than 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, calcareous silty clay loam

Subsoil:
8 to 15 inches—very dark gray, calcareous silty clay
15 to 24 inches—dark gray, calcareous silty clay
24 to 38 inches—dark grayish brown, mottled, calcareous silty clay that has nests of salts

Underlying layer:
38 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till
Seasonal high water table: At a depth of 0.5 foot to 1.5 feet
Flooding: None
Ponding: Occasional for brief periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Cubden soils on foot slopes around the outer edges of basins

Similar inclusions:
• Soils that are calcareous at a greater depth

Use and Management

Cropland or rangeland

Suitability: Suited to crops only in drained areas
Main crops: Alfalfa, corn, and soybeans
Management concerns: Wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to prevent soil compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Vw-2
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B2

Og—Orthents, gravelly

Composition

Orthents and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Excavations and spoil areas
Slope range: 0 to 60 percent
Shape of areas: Irregular
Size of areas: 3 to more than 20 acres

Typical Profile

Surface layer:
0 to 10 inches—light colored, calcareous gravelly loam

Underlying layer:
10 to 60 inches—brown and light yellowish brown, calcareous clay loam to gravelly sand

Soil Properties and Qualities

Drainage class: Excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 0 to 10 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Very rapid
Available water capacity: Very low
Organic matter content: Low
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Typical uses: Most areas of these soils are gravel pits used only as a source of sand and gravel for construction purposes. Some areas provide limited wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied.
Management concerns: The very low available water capacity
Management measures:
• Land shaping can reduce the slope, and the mounds of overburden material can be used as topsoil dressing.
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Applying fertilizer as needed helps to establish range or pasture plantings.

Interpretive Groups

Land capability classification: VIIIs-1
Range site: Very Shallow
Windbreak suitability group: 10
Pasture suitability group: NS

Pa—Parnell silty clay loam

Composition

Parnell and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 17 inches—dark gray silty clay loam
17 to 29 inches—very dark gray silty clay
29 to 48 inches—dark gray, mottled silty clay

Underlying layer:
48 to 60 inches—dark gray, mottled silty clay

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Cubden soils around the outer edges of basins

Similar inclusions:
• Soils that are calcareous throughout

Use and Management

Cropland or rangeland

Suitability: Generally unsuited to crops, except in drained areas
Main crops: Alfalfa, corn, and soybeans
Management concerns: Wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Vw-2
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Pm—Playmoor silty clay loam

Composition

Playmoor and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to more than 60 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray, calcareous silty clay loam that has nests of salts

Subsoil:
6 to 15 inches—very dark gray, calcareous silty clay loam that has nests of salts
15 to 24 inches—dark gray, mottled, calcareous silty clay loam that has nests of salts
24 to 33 inches—gray, calcareous silty clay loam that has nests of salts

Underlying layer:
33 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till or gravelly material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil is saline and has a high content of lime.

Inclusions

Contrasting inclusions:
• Badger soils, which have fewer salts than the Playmoor soil; on toe slopes
• Lamoure and Lowe soils, which have fewer salts in the surface layer than the Playmoor soil; on low flood plains

Similar inclusions:
• Soils that are more stratified

Use and Management

Cropland

Main crops: Barley
Management concerns: Salinity, wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:
• In most years this soil is better suited to late planted crops than to other crops.
• Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Only salt-tolerant crops or grasses should be planted.
• Maintaining existing drainage systems helps to remove excess water.
• Establishing a permanent cover of pasture or hayland plants helps to control erosion.

Interpretive Groups

Land capability classification: IVw-4
Range site: Saline Subirrigated
Windbreak suitability group: 10
Pasture suitability group: J

PoB—Poinsett-Buse-Waubay complex, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 40 to 50 percent
Buse and similar soils: 20 to 30 percent
Waubay and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and back slopes; Buse—shoulder slopes; Waubay—foot slopes
Slope range: Poinsett—2 to 6 percent; Buse—3 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Poinsett

Surface layer:
0 to 10 inches—dark gray silty clay loam
Subsoil:
10 to 15 inches—dark grayish brown silt loam
15 to 24 inches—light olive brown silt loam
24 to 38 inches—light yellowish brown, calcareous silt loam
38 to 44 inches—light brownish gray, mottled, calcareous silt loam
Underlying layer:
44 to 48 inches—light brownish gray, mottled, calcareous silty clay loam
48 to 60 inches—light brownish gray, mottled, calcareous clay loam

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam
Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam
Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam
Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam
Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Buse—greater than 60 inches; Waubay—40 to more than 60 inches over loamy glacial till
Seasonal high water table: Poinsett—at a depth of more than 6 feet; Buse—at a depth of more than 6 feet; Waubay—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Organic matter content: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Poinsett—medium; Buse—medium; Waubay—slow
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toe slopes
• The somewhat poorly drained Cubden soils on foot

slopes around the edges of basins
• The very poorly drained Parnell soils in basins
• The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in some areas the slopes are too short or too irregular to be farmed on the contour.
• Applying animal waste, especially on the Buse soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion (fig. 7).
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Buse—IIIe-6; Waubay—I-3
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PoC—Poinsett-Buse-Waubay complex, 2 to 9 percent slopes

Composition

Poinsett and similar soils: 35 to 45 percent
Buse and similar soils: 25 to 35 percent
Waubay and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Poinsett—back slopes; Buse—shoulder slopes; Waubay—foot slopes
Slope range: Poinsett—6 to 9 percent; Buse—6 to 9 percent; Waubay—2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Poinsett

Surface layer:
0 to 10 inches—dark gray silty clay loam
Subsoil:
10 to 15 inches—dark grayish brown silt loam
15 to 24 inches—light olive brown silt loam
24 to 38 inches—light yellowish brown, calcareous silt loam
38 to 44 inches—light brownish gray, mottled, calcareous silt loam
Underlying layer:
44 to 48 inches—light brownish gray, mottled, calcareous silty clay loam
48 to 60 inches—light brownish gray, mottled, calcareous clay loam

Buse

Surface layer:
0 to 9 inches—dark gray, calcareous loam
Subsoil:
9 to 25 inches—pale brown, mottled, calcareous clay loam
Underlying layer:
25 to 40 inches—pale brown, mottled, calcareous clay loam
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam
Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam
Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Buse—greater than 60 inches; Waubay—40 to more than 60 inches over loamy glacial till
Seasonal high water table: Poinsett—at a depth of more than 6 feet; Buse—at a depth of more than 6 feet; Waubay—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately

Figure 7.—A field windbreak planted on the contour in an area of Poinsett-Buse-Waubay complex, 1 to 6 percent slopes.

slow; Waubay—moderate

Available water capacity: High

Organic matter content: Poinsett—high; Buse—moderately low; Waubay—high

Surface runoff: Medium

Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Badger soils on toe slopes

• The somewhat poorly drained Cubden soils on foot slopes around the edges of basins

• The very poorly drained Parnell soils in basins

• The poorly drained Tonka soils in basins

Similar inclusions:

• Soils that have more sand between depths of 10 and 40 inches than the Poinsett soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat

Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—water erosion

Management measures:

• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.

• Contour farming, terraces, and grassed waterways help to control water erosion, but in some areas the

slopes are too short or too irregular for contour farming and terraces.
• Applying animal waste, especially on the Buse soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—IIIe-2; Buse—IVe-2; Waubay—IIe-1
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Silty
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PrB—Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 35 to 45 percent
Rusklyn and similar soils: 25 to 35 percent
Waubay and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and back slopes; Rusklyn—shoulder slopes; Waubay—foot slopes
Slope range: Poinsett—2 to 6 percent; Rusklyn—2 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Poinsett

Surface layer:
0 to 10 inches—dark gray silty clay loam
Subsoil:
10 to 15 inches—dark grayish brown silt loam
15 to 24 inches—light olive brown silt loam
24 to 38 inches—light yellowish brown, calcareous silt loam
38 to 44 inches—light brownish gray, mottled, calcareous silt loam
Underlying layer:
44 to 48 inches—light brownish gray, mottled, calcareous silty clay loam
48 to 60 inches—light brownish gray, mottled, calcareous clay loam

Rusklyn

Surface layer:
0 to 8 inches—grayish brown, calcareous silt clay loam
Subsoil:
8 to 23 inches—pale brown, calcareous silt loam
23 to 34 inches—light yellowish brown, mottled, calcareous silt loam
Underlying layer:
34 to 60 inches—very pale brown and light yellowish brown, mottled, calcareous silt loam

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam
Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam
Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Rusklyn—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Rusklyn—40 to more than 60 inches over glacial till; Waubay—40 to more than 60 inches over loamy glacial till
Seasonal high water table: Poinsett—at a depth of more than 6 feet; Rusklyn—at a depth of more than 6 feet; Waubay—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: Poinsett—high; Rusklyn—moderately low; Waubay—high
Surface runoff: Poinsett—medium; Rusklyn—medium; Waubay—slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt. The Rusklyn soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toe slopes
• The somewhat poorly drained Cubden soils on foot slopes around the edges of basins
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand between depths of 10 and 40 inches than the Rusklyn soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Rusklyn—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in some areas the slopes are too short or too irregular to be farmed on the contour.
• Applying animal waste, especially on the Rusklyn soil, helps to maintain fertility.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Rusklyn—IIIe-6; Waubay—I-3
Range site: Poinsett—Silty; Rusklyn—Thin Upland; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Rusklyn—8; Waubay—1
Pasture suitability group: Poinsett—F; Rusklyn—G; Waubay—K

PwA—Poinsett-Waubay silty clay loams, 0 to 2 percent slopes

Composition

Poinsett and similar soils: 50 to 60 percent
Waubay and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and back slopes; Waubay—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

Poinsett

Surface layer:
0 to 10 inches—dark gray silty clay loam
Subsoil:
10 to 15 inches—dark grayish brown silt loam
15 to 24 inches—light olive brown silt loam
24 to 38 inches—light yellowish brown, calcareous silt loam
38 to 44 inches—light brownish gray, mottled, calcareous silt loam
Underlying layer:
44 to 48 inches—light brownish gray, mottled, calcareous silty clay loam
48 to 60 inches—light brownish gray, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam
Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam
Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Seasonal high water table: Poinsett—at a depth of more than 6 feet; Waubay—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Rusklyn and Buse soils, which are calcareous at or near the surface; on shoulder slopes
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toe slopes
• The somewhat poorly drained Cubden soils on foot slopes around the edges of basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Poinsett—I-2; Waubay—I-3
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1
Pasture suitability group: Poinsett—F; Waubay—K

PwB—Poinsett-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 60 to 70 percent
Waubay and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and back slopes; Waubay—foot slopes
Slope range: Poinsett—2 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Typical Profile

Poinsett

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 15 inches—dark grayish brown silt loam
15 to 24 inches—light olive brown silt loam
24 to 38 inches—light yellowish brown, calcareous silt loam
38 to 44 inches—light brownish gray, mottled, calcareous silt loam

Underlying layer:
44 to 48 inches—light brownish gray, mottled, calcareous silty clay loam
48 to 60 inches—light brownish gray, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam

Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Seasonal high water table: Poinsett—at a depth of more than 6 feet; Waubay—at a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Poinsett—medium; Waubay—slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall and snowmelt.

Inclusions

Contrasting inclusions:
• Rusklyn and Buse soils, which are calcareous at or near the surface; on shoulder slopes
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toe slopes
• The somewhat poorly drained Cubden soils on the edges of basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in some areas the slopes are too short or too irregular to be farmed on the contour.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Waubay—I-3
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1

Pasture suitability group: Poinsett—F; Waubay—K

RfA—Renshaw-Fordville loams, 0 to 2 percent slopes

Composition

Renshaw and similar soils: 45 to 65 percent
Fordville and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Renshaw—summits and back slopes; Fordville—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Renshaw

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 16 inches—dark grayish brown loam
16 to 18 inches—brown gravelly loam

Underlying layer:
18 to 60 inches—multicolored, calcareous very gravelly loamy sand

Fordville

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 21 inches—dark brown loam
21 to 29 inches—yellowish brown loam

Underlying layer:
29 to 36 inches—multicolored, calcareous gravelly loamy sand
36 to 60 inches—multicolored, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Fordville—well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Fordville—20 to 40 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Renshaw—low; Fordville—moderate
Organic matter content: Renshaw—moderate; Fordville—high
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Renshaw—low available water capacity; Fordville—moderate available water capacity
Management measures:
• These soils are better suited to early maturing crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Renshaw—IIIs-3; Fordville—IIs-3
Range site: Renshaw—Shallow to Gravel; Fordville—Silty
Windbreak suitability group: Renshaw—6; Fordville—6
Pasture suitability group: Renshaw—D2; Fordville—D1

RfB—Renshaw-Fordville loams, 2 to 6 percent slopes

Composition

Renshaw and similar soils: 50 to 70 percent
Fordville and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Renshaw—summits and back slopes; Fordville—foot slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

Renshaw

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 16 inches—dark grayish brown loam
16 to 18 inches—brown gravelly loam

Underlying layer:
18 to 60 inches—multicolored, calcareous very gravelly loamy sand

Fordville

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 21 inches—dark brown loam
21 to 29 inches—yellowish brown loam

Underlying layer:
29 to 36 inches—multicolored, calcareous gravelly loamy sand
36 to 60 inches—multicolored, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Fordville—well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Fordville—20 to 40 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Renshaw—low; Fordville—moderate
Organic matter content: Renshaw—moderate; Fordville—high
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils on foot slopes near basins
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa (fig. 8), barley, oats, and spring wheat
Management concerns: Renshaw—low available water capacity, water erosion; Fordville—moderate available water capacity, water erosion
Management measures:
• These soils are better suited to early maturing crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Renshaw—IVs-2; Fordville—IIe-5
Range site: Renshaw—Shallow to Gravel; Fordville—Silty
Windbreak suitability group: Renshaw—6; Fordville—6
Pasture suitability group: Renshaw—D2; Fordville—D1

RsB—Renshaw-Sioux complex, 2 to 6 percent slopes

Composition

Renshaw and similar soils: 55 to 65 percent
Sioux and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Renshaw—summits and back slopes; Sioux—shoulder slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Renshaw

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 16 inches—dark grayish brown loam
16 to 18 inches—brown gravelly loam

Underlying layer:
18 to 60 inches—multicolored, calcareous very gravelly loamy sand

Sioux

Surface layer:
0 to 8 inches—dark gray gravelly loam

Transitional layer:
8 to 13 inches—dark grayish brown, calcareous very gravelly sandy loam

Figure 8.—Alfalfa in an area of Renshaw-Fordville loams, 2 to 6 percent slopes.

Underlying layer:
13 to 60 inches—multicolored, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Sioux—6 to 14 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Renshaw—low; Sioux—very low
Organic matter content: Renshaw—moderate; Sioux—moderately low
Surface runoff: Renshaw—medium; Sioux—very slow

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes

Use and Management

Cropland

Main crops: Renshaw—alfalfa, barley, oats, and spring wheat; Sioux—unsuited to crops
Management concerns: Renshaw—low available water capacity, water erosion; Sioux—very low available water capacity, water erosion

Management measures:
• The Renshaw soil is better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Renshaw—IVs-2; Sioux—VIs-3
Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow
Windbreak suitability group: Renshaw—6; Sioux—10
Pasture suitability group: Renshaw—D2; Sioux—NS

RsC—Renshaw-Sioux complex, 6 to 9 percent slopes

Composition

Renshaw and similar soils: 45 to 55 percent
Sioux and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Renshaw—back slopes; Sioux—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Renshaw

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 16 inches—dark grayish brown loam
16 to 18 inches—brown gravelly loam

Underlying layer:
18 to 60 inches—multicolored, calcareous very gravelly loamy sand

Sioux

Surface layer:
0 to 8 inches—dark gray gravelly loam

Transitional layer:
8 to 13 inches—dark grayish brown, calcareous very gravelly sandy loam

Underlying layer:
13 to 60 inches—multicolored, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Sioux—6 to 14 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Renshaw—low; Sioux—very low
Organic matter content: Renshaw—moderate; Sioux—moderately low
Surface runoff: Renshaw—medium; Sioux—slow

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes

Use and Management

Cropland

Main crops: Renshaw—alfalfa, barley, oats, and spring wheat; Sioux—unsuited to crops
Management concerns: Renshaw—low available water capacity, water erosion; Sioux—very low available water capacity, water erosion
Management measures:
• The Renshaw soil is better suited to early maturing crops, such as small grain, than to other crops.
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—IVe-4; Sioux—VIs-3
Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow
Windbreak suitability group: Renshaw—6; Sioux—10
Pasture suitability group: Renshaw—D2; Sioux—NS

SnA—Sinai silty clay, 0 to 2 percent slopes

Composition

Sinai and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains
Landform position: Summits and back slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 80 to more than 100 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay
Subsoil:
8 to 23 inches—dark grayish brown clay
23 to 31 inches—grayish brown, calcareous silty clay
31 to 38 inches—light brownish gray, mottled, calcareous silty clay
Underlying layer:
38 to 48 inches—light brownish gray, mottled, calcareous silty clay
48 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Very slow
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• Hetland soils, which have less clay between depths of 10 and 40 inches than the Sinai soil; in positions on the landscape similar to those of the Sinai soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slow rate of water infiltration, tilth, and wind erosion
Management measures:
• Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter and tilth.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: IIs-2
Range site: Clayey
Windbreak suitability group: 4
Pasture suitability group: I

SrD—Sioux-Renshaw complex, 9 to 15 percent slopes

Composition

Sioux and similar soils: 45 to 55 percent
Renshaw and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Sioux—shoulder slopes; Renshaw—back slopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Sioux

Surface layer:
0 to 8 inches—dark gray gravelly loam
Transitional layer:
8 to 13 inches—dark grayish brown, calcareous very gravelly sandy loam
Underlying layer:
13 to 60 inches—multicolored, calcareous very gravelly loamy sand

Renshaw

Surface layer:
0 to 8 inches—dark gray loam
Subsoil:
8 to 16 inches—dark grayish brown loam
16 to 18 inches—brown gravelly loam
Underlying layer:
18 to 60 inches—multicolored, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained

Depth to bedrock: Very deep
Depth to contrasting layer: Sioux—6 to 14 inches over gravelly material; Renshaw—14 to 20 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Sioux—very rapid; Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Sioux—very low; Renshaw—low
Organic matter content: Sioux—moderately low; Renshaw—moderate
Surface runoff: Sioux—slow; Renshaw—rapid

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes

Use and Management

Rangeland

Management concerns: Sioux—very low available water capacity, water erosion; Renshaw—low available water capacity, water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—VIs-3; Renshaw—VIe-6
Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel
Windbreak suitability group: Sioux—10; Renshaw—10
Pasture suitability group: Sioux—NS; Renshaw—NS

Ss—Southam silty clay loam

Composition

Southam and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
0 to 12 inches—dark gray, calcareous silty clay loam
Subsurface layer:
12 to 25 inches—dark gray, mottled, calcareous silty clay
Underlying layer:
25 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 5 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: Very high
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• Oldham soils, which are ponded for shorter periods than the Southam soil
Similar inclusions:
• Soils that are leached to a greater depth

Use and Management

Cropland

Suitability:
• Because of the wetness, this soil is not suited to crops.

Wildlife habitat

• Areas of this soil should be maintained as wildlife habitat (fig. 9).

Interpretive Groups

Land capability classification: VIIIw-1
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

St—Stickney-Dudley silt loams

Composition

Stickney and similar soils: 40 to 50 percent
Dudley and similar soils: 35 to 45 percent
Contrasting inclusions: 10 to 20 percent

Figure 9.—This area of Southam silty clay loam provides good habitat for wetland wildlife.

Setting

Landform: Till plains
Landform position: Stickney—summits and back slopes; Dudley—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Stickney

Surface layer:
0 to 6 inches—dark grayish brown silt loam

Subsurface layer:
6 to 10 inches—brown loam

Transitional layer:
10 to 11 inches—brown clay loam

Subsoil:
11 to 20 inches—brown clay loam
20 to 35 inches—very pale brown, calcareous clay loam

Underlying layer:
35 to 60 inches—light gray, mottled, calcareous clay loam that has nests of salts

Dudley

Surface layer:
0 to 6 inches—gray silt loam

Subsurface layer:
6 to 9 inches—grayish brown silt loam

Subsoil:
9 to 17 inches—dark gray clay loam
17 to 21 inches—dark gray clay loam that has nests of salts
21 to 36 inches—light brownish gray, calcareous clay loam that has nests of salts

Underlying layer:
36 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: At a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Stickney—slow; Dudley—very slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow
Other properties: Both soils have a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The poorly drained Hoven soil in basins
• Beadle and Houdek soils, which do not have a sodium-affected subsoil; on summits and back slopes

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, sorghum, sunflowers, and winter wheat
Management concerns: The slow rate of water infiltration and the sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots
Management measures:
• Minimizing tillage, leaving crop residue on the surface, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Stickney—IIIs-1; Dudley—IVs-2
Range site: Stickney—Clayey; Dudley—Claypan
Windbreak suitability group: Stickney—4; Dudley—9
Pasture suitability group: Stickney—E; Dudley—C

Sv—Stickney-Dudley-Hoven silt loams

Composition

Stickney and similar soils: 30 to 40 percent
Dudley and similar soils: 25 to 30 percent
Hoven and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Stickney—summits and back slopes; Dudley—foot slopes; Hoven—basins
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 100 to more than 2,000 acres

Typical Profile

Stickney

Surface layer:
0 to 6 inches—dark grayish brown silt loam

Subsurface layer:
6 to 10 inches—brown loam

Transitional layer:
10 to 11 inches—brown clay loam

Subsoil:
11 to 20 inches—brown clay loam
20 to 35 inches—very pale brown, calcareous clay loam

Underlying layer:
35 to 60 inches—light gray, mottled, calcareous clay loam that has nests of salts

Dudley

Surface layer:
0 to 6 inches—gray silt loam

Subsurface layer:
6 to 9 inches—grayish brown silt loam

Subsoil:
9 to 17 inches—dark gray clay loam
17 to 21 inches—dark gray clay loam that has nests of salts
21 to 36 inches—light brownish gray, calcareous clay loam that has nests of salts

Underlying layer:
36 to 60 inches—light brownish gray, mottled, calcareous clay loam

Hoven

Surface layer:
0 to 2 inches—gray silt loam

Subsoil:
2 to 5 inches—dark gray, mottled silty clay
5 to 32 inches—very dark gray silty clay that has nests of gypsum and other salts in the lower part
32 to 40 inches—grayish brown, calcareous silty clay loam that has nests of gypsum and other salts

Underlying layer:
40 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Stickney—moderately well drained; Dudley—moderately well drained; Hoven—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: Stickney—at a depth of 3.5 to 5.0 feet; Dudley—at a depth of 3.5 to 5.0 feet; Hoven—1 foot above to 1.5 feet below the surface
Flooding: None
Ponding: Stickney—none; Dudley—none; Hoven—frequent for long periods
Permeability: Stickney—slow; Dudley—very slow; Hoven—very slow
Available water capacity: Stickney—high; Dudley—high; Hoven—moderate
Organic matter content: Moderate
Surface runoff: Stickney—slow; Dudley—slow; Hoven—negligible
Other properties: All three soils have a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• Beadle and Houdek soils, which do not have a sodium-affected subsoil; on summits and back slopes
• The poorly drained Tetonka soils, which do not have a sodium-affected subsoil; in basins
• The moderately well drained Jerauld soils, which have visible salts within a depth of 16 inches; on the lower foot slopes

Use and Management

Cropland

Main crops: Alfalfa, spring wheat, sorghum, sunflowers, and winter wheat
Management concerns: Stickney and Dudley—the sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots, and a slow rate of water infiltration; Hoven—wetness, the sodium-affected subsoil, which adversely affects plant growth by restricting the penetration of plant roots, and a slow rate of water infiltration
Management measures:
• Minimizing tillage, leaving crop residue on the surface, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter and tilth.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.
• Deferring tillage during wet periods, especially in areas of the Hoven soil, helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Stickney—IIIs-1; Dudley—IVs-2; Hoven—VIs-6
Range site: Stickney—Clayey; Dudley—Claypan; Hoven—Closed Depression
Windbreak suitability group: Stickney—4; Dudley—9; Hoven—10
Pasture suitability group: Stickney—E; Dudley—C; Hoven—B2

TdD—Talmo-Delmont loams, 6 to 15 percent slopes

Composition

Talmo and similar soils: 55 to 65 percent
Delmont and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Talmo—shoulder slopes; Delmont—back slopes
Slope range: 6 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 30 acres

Typical Profile

Talmo

Surface layer:
0 to 7 inches—dark gray loam
Underlying layer:
7 to 60 inches—grayish brown, calcareous extremely gravelly loamy sand

Delmont

Surface layer:
0 to 9 inches—dark gray loam
Subsoil:
9 to 18 inches—dark grayish brown loam
Underlying layer:
18 to 45 inches—grayish brown, calcareous very gravelly loamy sand
45 to 60 inches—light yellowish brown, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Talmo—excessively drained; Delmont—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Talmo—6 to 14 inches over

gravelly material; Delmont—14 to 20 inches over gravelly material
Seasonal high water table: At a depth of more than 6 feet
Flooding: None
Ponding: None
Permeability: Talmo—very rapid; Delmont—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Talmo—very low; Delmont—low
Organic matter content: Talmo—moderately low; Delmont—moderate
Surface runoff: Talmo—slow; Delmont—rapid

Inclusions

Contrasting inclusions:
• The well drained Ethan soils on back slopes

Similar inclusions:
• Soils that are deeper to gravelly material than the Delmont soil

Use and Management

Rangeland

Management concerns: Sioux—very low available water capacity, water erosion; Renshaw—low available water capacity, water erosion
Management measures:
• Proper grazing management maintains plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Talmo—VIs-4; Delmont—VIe-5
Range site: Talmo—Very Shallow; Delmont—Shallow to Gravel
Windbreak suitability group: Talmo—10; Delmont—6
Pasture suitability group: Talmo—NS; Delmont—NS

Te—Tetonka silt loam

Composition

Tetonka and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 10 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray silt loam

Subsurface layer:
10 to 21 inches—gray, mottled loam

Subsoil:
21 to 31 inches—gray clay loam
31 to 40 inches—grayish brown clay loam
40 to 48 inches—light brownish gray, mottled clay loam

Underlying layer:
48 to 54 inches—light olive gray, mottled, calcareous clay loam
54 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 1 foot above to 1 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Crossplain soils on toe slopes
• The very poorly drained Worthing soils in the center of basins
• The moderately well drained Davison soils on foot slopes

Use and Management

Cropland

Main crops: Corn, soybeans, and sunflowers
Management concerns: Wetness
Management measures:
• In most years this soil is better suited to late planted crops than to other crops.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Maintaining the existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-1
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

To—Tonka silty clay loam

Composition

Tonka and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to more than 20 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray silty clay loam

Subsurface layer:
7 to 13 inches—dark gray silty clay loam
13 to 19 inches—gray, mottled silt loam

Subsoil:
19 to 30 inches—very dark gray silty clay
30 to 40 inches—dark gray silty clay
40 to 51 inches—grayish brown, mottled silty clay loam

Underlying layer:
51 to 60 inches—light brownish gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils around the outer edges of basins
• The somewhat poorly drained Cubden soils on foot slopes
• The very poorly drained Parnell soils in the center of basins

Use and Management

Cropland

Main crops: Corn, soybeans
Management concerns: Wetness
Management measures:
• In most years this soil is better suited to late planted crops than to other crops.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Maintaining the existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-2
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

VbA—Vienna-Brookings complex, 0 to 2 percent slopes

Composition

Vienna and similar soils: 65 to 75 percent
Brookings and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and back slopes; Brookings—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to more than 60 acres

Typical Profile

Vienna

Surface layer:
0 to 8 inches—dark grayish brown silt loam

Subsoil:
8 to 16 inches—brown silty clay loam
16 to 24 inches—yellowish brown, mottled, calcareous clay loam
24 to 32 inches—pale brown, mottled, calcareous clay loam

Underlying layer:
32 to 60 inches—pale brown, mottled, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—dark gray silty clay loam

Subsoil:
17 to 25 inches—brown silty clay loam
25 to 39 inches—light yellowish brown, mottled, calcareous silty clay loam

Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Seasonal high water table: Vienna—at a depth of more than 6 feet; Brookings—at a depth of 3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Egeland soils, which have more sand than the major soils; in positions on the landscape similar to those of the Vienna soil
• Embden soils, which have more sand than the major soils; in positions on the landscape similar to those of the Brookings soil
• Poinsett soils, which have less sand than the major soils; in positions on the landscape similar to those of the Vienna soil
• The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns:
• Only slight limitations affect the use of these soils for crops.
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Vienna—I-2; Brookings—I-3
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

VbB—Vienna-Brookings complex, 1 to 6 percent slopes

Composition

Vienna and similar soils: 65 to 75 percent
Brookings and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and back slopes; Brookings—foot slopes
Slope range: Vienna—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to more than 80 acres

Typical Profile

Vienna

Surface layer:
0 to 8 inches—dark grayish brown silt loam
Subsoil:
8 to 16 inches—brown silty clay loam
16 to 24 inches—yellowish brown, mottled, calcareous clay loam
24 to 32 inches—pale brown, mottled, calcareous clay loam
Underlying layer:
32 to 60 inches—pale brown, mottled, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—dark gray silty clay loam
Subsoil:
17 to 25 inches—brown silty clay loam
25 to 39 inches—light yellowish brown, mottled, calcareous silty clay loam
Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Seasonal high water table: Vienna—at a depth of more than 6 feet; Brookings—at a depth of 3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Vienna—medium; Brookings—slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Egeland soils, which have more sand than the major soils; in positions on the landscape similar to those of the Vienna soil
• Embden soils, which have more sand than the major soils; in positions on the landscape similar to those of the Brookings soil
• Poinsett soils, which have less sand than the major soils; in positions on the landscape similar to those of the Vienna soil
• The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but in some areas the slopes are too short or too irregular to be farmed on the contour.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Vienna—IIe-2; Brookings—I-3
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

Wa—Waubay silty clay loam

Composition

Waubay and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Foot slopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 20 to more than 100 acres

Typical Profile

Surface soil:
0 to 14 inches—very dark gray silty clay loam
Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam
Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Seasonal high water table: At a depth of 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils, which have more clay in the subsoil than the Waubay soil; on toe slopes
• Cubden soils, which are calcareous at or near the surface; on foot slopes
• The poorly drained Tonka soils in basins
• The well drained Poinsett soils on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns:
• Only slight limitations affect the use of this soil for crops.
Management measures:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: I-3
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Wb—Waubay-Badger silty clay loams

Composition

Waubay and similar soils: 45 to 55 percent
Badger and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Waubay—foot slopes; Badger—toe slopes
Slope range: Waubay—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 100 acres

Typical Profile

Waubay

Surface soil:
0 to 14 inches—very dark gray silty clay loam

Subsoil:
14 to 25 inches—dark grayish brown silty clay loam
25 to 42 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
42 to 60 inches—grayish brown, mottled, calcareous clay loam

Badger

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 35 inches—dark gray silty clay
35 to 46 inches—light brownish gray, mottled silty clay loam

Underlying layer:
46 to 55 inches—light brownish gray, mottled silty clay loam
55 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Waubay—moderately well drained; Badger—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Waubay—40 to more than 60 inches over loamy glacial till; Badger—40 to more than 60 inches over glacial till
Seasonal high water table: Waubay—at a depth of 3.5 to 5.0 feet; Badger—at the surface to 3.0 feet below the surface
Flooding: Waubay—none; Badger—frequent for brief periods
Ponding: None
Permeability: Waubay—moderate; Badger—slow
Available water capacity: High
Organic matter content: High
Surface runoff: Waubay—slow; Badger—very slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Cubden soils, which are calcareous at or near the surface; on foot slopes
• The poorly drained Tonka soils in basins
• The well drained Poinsett soils on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Waubay—none; Badger—wetness
Management measures:
• In wet years the Badger soil is better suited to late planted crops than to other crops.
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to maintain the content of organic matter and tilth.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Deferring tillage on the Badger soil during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Waubay—I-3; Badger—IIw-1
Range site: Waubay—Loamy Overflow; Badger—Loamy Overflow
Windbreak suitability group: Waubay—1; Badger—2
Pasture suitability group: Waubay—K; Badger—A

Wo—Worthing silty clay loam

Composition

Worthing and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 45 inches—dark gray silty clay
45 to 60 inches—light olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 2 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The poorly drained Tetonka soils, which are around the outer edges of basins
• The poorly drained Hoven soils, which have a sodium-affected subsoil; on the outer edge of basins
• The moderately well drained Davison soils on foot slopes

Similar inclusions:
• Soils that are ponded for longer periods of time

Use and Management

Cropland or rangeland

Main crops: In drained areas—alfalfa, corn, and soybeans
Management concerns: Wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Vw-4
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Wp—Worthing silty clay loam, ponded

Composition

Worthing and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 15 to more than 200 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 45 inches—dark gray silty clay
45 to 60 inches—light olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Greater than 60 inches
Seasonal high water table: 3.0 feet above to 0.5 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The poorly drained Tetonka soils, which are ponded for shorter periods of time than the Worthing soil; on the slightly higher parts of basins

Use and Management

Cropland

Suitability:
• Because of the wetness, this soil is not suited to crops.

Wildlife habitat

• Areas of this soil should be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: VIIIw-1
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department

of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 268,700 acres in the survey area, or nearly 48 percent of the total acreage, meets the soil requirements for prime farmland. The areas of prime farmland are throughout the county. About 90 percent of the acreage of prime farmland is used for crops. The major crops are corn, spring wheat, soybeans, and alfalfa.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table or inadequate rainfall, qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the county are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops

Dennis Shoup, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

About 66 percent of the acreage in Kingsbury County is used for cultivated crops (U.S. Department of Commerce, 1987). The major crops are corn, spring wheat, soybeans, and alfalfa. Oats, barley, sunflowers, rye, grain sorghum, flax, and buckwheat also are grown. Alfalfa is harvested mainly for hay, and corn is harvested for both silage and grain. Oats are grown as a cash crop and as livestock feed.

The potential of the soils in the county for increased crop production is good. Crop production could be increased considerably by applying the latest crop production technology in all areas used as cropland. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion reduces productivity and results in sedimentation. It is a hazard on soils that have slopes of more than 2 percent, such as Barnes, Beadle, Betts, Brandt, Buse, Clarno, Delmont, Egeland, Ethan, Fordville, Hetland, Houdek, Poinsett, Renshaw, and Vienna soils. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a thin

surface layer, such as Betts, Buse, and Ethan soils. Erosion is also a concern in areas where the soils tend to be droughty, such as areas of Delmont and Renshaw soils. Erosion on cropland can result in the sedimentation of streams, lakes, and reservoirs. Measures that control erosion minimize this pollution and preserve the quality of water for fish and other wildlife and for recreational uses. Also, controlling erosion can reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients and of pesticides that have been applied to the soils.

Using a conservation cropping system that keeps a protective cover of vegetation on the surface for extended periods can help to hold soil losses to an amount that does not reduce the productive capacity of the soils. Careful management of crop residue is necessary.

Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce the runoff rate, and help to control erosion. Combined with grassed waterways, these practices are suitable on most of the soils in the county.

Conservation tillage includes tillage systems that do not invert the soil and that retain a protective cover of crop residue on the surface throughout the year. It is effective in controlling wind erosion and water erosion. Conservation tillage includes no-till, strip-till, stubble mulching, and chemical fallow systems that involve a minimum number of tillage operations. Stubble is left standing during the winter. It traps and holds snow on the field; when the snow melts, more water is allowed to infiltrate into the soil.

Terraces and diversions reduce the runoff rate and help to control erosion by reducing the length of slopes. These measures are most practical on deep, well drained soils that have long, smooth slopes, such as Poinsett soils. Many areas in Kingsbury County, however, are poorly suited to terraces and diversions because the slopes are short and irregular. In these areas, a cropping system that maintains a substantial amount of plant cover on the surface is needed.

Wind erosion is a slight to severe hazard on some of the soils in the county. The hazard is greatest on soils that have a surface layer of sandy loam, fine sandy loam, or loamy sand, such as Blendon, Egeland, Embden, Henkin, Maddock, Minnewasta, and Minnewaukan soils. Soils that have a high content of lime in the surface layer, such as Buse, Cubden, Davison, Ethan, and Rusklyn soils, are also highly susceptible to wind erosion. Because of the high content of lime, the soil aggregates are about the size of sand. These soils can be damaged in a few hours if winds are strong and the soils are dry and are not protected by a cover of vegetation or surface mulch. Wind erosion can be controlled by an adequate plant cover, a cover of crop residue, stripcropping, and tillage methods that keep the surface rough. Including grasses and legumes in the cropping system, planting windbreaks of suitable trees and shrubs, and leaving strips of unharvested crops also are effective in reducing the hazard of wind erosion.

Information about measures that control erosion on each kind of soil is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is a major limitation on some soils in the county, including Oldham, Parnell, Tetonka, Tonka, and Worthing soils.

Soil fertility helps to determine the yields that can be obtained from the soil. The kinds and amounts of fertilizer needed on Cubden, Davison, Ethan, and other soils that have a high content of lime in the surface layer differ from those needed on other soils. Including grasses and legumes in the cropping system and regularly adding manure improve the fertility of soils that have a high content of lime. On all soils, the additions of fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The South Dakota Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed. A nutrient management plan should be based on the type of soil, the amount of available moisture, the kind of crop to be planted, realistic yield goals, and current soil fertility test levels. Other considerations include whether or not legumes have been planted in either of the last 2 years, whether or not agricultural waste has been applied, and the likelihood that surface water or ground water will be polluted by nutrients. The plan should be developed annually and should provide for the amount of each nutrient needed, the preferred method of application, and the preferred time of application. The Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station can help in developing a nutrient management plan.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. If tilled when wet, Badger, Crossplain, and Lamoure and similar soils tend to become very cloddy. As a result of the cloddiness, preparing a good seedbed is difficult. These soils dry slowly in the spring and cannot easily be tilled. Selecting a proper time for tillage, including grasses and legumes in the cropping system, and incorporating crop residue into the soil improve tilth and increase the rate of water infiltration. Management measures that

promote good tilth generally result in an increased rate of water infiltration and a higher water-holding capacity and thus provide a better environment for seedling emergence and root development. These positive effects increase crop yields. Improved soil tilth also reduces the amount of horsepower required for tillage. Management measures that improve soil tilth include using high-residue crops in the rotation; deferring tillage or grazing when the soils are wet, especially in areas of soils that have a claypan, such as Dudley and Stickney soils; leaving as much residue as possible at or near the surface of the soil; and eliminating unnecessary tillage trips.

Field crops suited to the soils and climate of the area include small grain and row crops. Spring wheat, barley, and oats are the main small grain crops. Corn and soybeans are the main row crops. Some of the corn is grown for silage.

Very deep, well drained soils, such as Clarno and Poinsett soils, are suited to all of the crops commonly grown in the county. Delmont and Renshaw soils are better suited to early maturing small grain than to the deeper rooted, late maturing crops, such as sorghum and alfalfa, because these soils have a low available water capacity. The erodible Egeland, Embden, and Maddock soils are suited to high-residue crops, such as small grain and alfalfa. With proper management, these crops produce enough residue to protect the field from wind erosion. If low-residue crops, such as sunflowers, are planted or a summer fallow system is used, field windbreaks, no-till farming, or other conservation practices may be needed to reduce the hazard of wind erosion.

Pasture and Hayland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Pasture and hayland are used for the production of adapted perennial forage plants to be grazed by livestock or harvested for hay. These forage plants may be either native or introduced species and may be seeded alone or in mixtures. Generally, these species are established as part of a long-term forage program, but in some areas legumes or grasses have been established as part of a short-term crop rotation.

About 18 percent of the county is classified as pasture and hayland (USDA, 1987). This acreage supplies a major portion of the forage for livestock. It includes areas that formerly supported native vegetation but have been invaded or reseeded by introduced tame grasses, such as smooth brome, because of overgrazing in the past. Managing these sites as native rangeland is no longer practical in many cases. Because of overgrazing, improper management, and poor agronomic practices, much of the pasture or hayland is presently producing well below its potential.

Proper management of pasture and hayland is needed to obtain sustained maximum yields. Proper stocking rates allow the pasture plants to retain their vigor. Overgrazing results in depletion of the root systems of the pasture plants. If continued overgrazing is allowed, the plants will eventually die out and be replaced by less desirable species and weeds. A planned grazing system that includes periods of adequate rest or deferment for the key pasture species improves plant vigor and thus improves production. Including rest periods between periods of grazing allows the pasture plants to regrow and replenish their energy reserves. Harvesting hay crops at the proper stage of plant growth also helps to maintain plant vigor. Generally, the plants should be allowed to grow to early or mid bloom stage before they are harvested. Grazing pasture species at the proper stage of growth also increases production. The plants should not be grazed before they have produced enough leaf material to replenish stored energy reserves. Generally, the plants should be allowed to grow to a height of 8 to 14 inches before they are grazed. The proper height depends on the species being managed. If the plants become too tall or mature before grazing is allowed, the quality and quantity of the forage can be affected. Also, allowing the plants to regrow before the first killing frost provides adequate energy reserves for survival through the winter and for the initiation of regrowth in the spring. Allowing regrowth also increases the ability of the plants to trap snow, thereby increasing soil moisture.

Pasture and hayland species can be divided into two broad categories. Cool-season species begin their growth in the early spring and reach maturity in early summer. If soil moisture is adequate, they may regrow in the fall when temperatures cool. Warm-season species begin growth in the early summer. They produce most of their forage during the hot summer months. Cool-season plants include smooth brome, intermediate wheatgrass, and alfalfa. Warm-season species include big bluestem and switchgrass. Selecting a warm-season species will ensure a productive, nutritious forage source for livestock during July and August. Using a cool-season species during this same period would produce less forage.

Proper management includes periodic reestablishment of pasture and hayland. The length of time that pasture and hayland remain productive depends on the plant species, the type of soil, climatic factors, and management techniques. Generally, many of the tame species should be replaced every 5 to 10 years. Native species that are adapted to the site

generally remain productive for an extended period of time, depending on the kind of management applied. Species selection should be based on the type of soil and on producer needs. Using improved varieties can result in increased production, improved forage quality, and improved establishment and longevity of the stands.

Maintaining soil fertility is an important management concern. Applications of fertilizer should be based on the results of soil tests. Care should be taken to prevent the contamination of water supplies. Proper levels of fertilization can increase production, increase the longevity of the stand, and improve the quality of forage. Planting legumes, such as alfalfa, in combination with grasses can increase the nitrogen level and thus help to meet the nutrient needs of grass species.

Weeds can be a problem if proper management techniques are not applied. Allowing overgrazing, selecting species that are not adapted to the site, and failing to maintain soil fertility can increase the extent of weeds in areas of pasture and hayland.

At the end of each map unit description and in the section "Interpretive Groups," the soil has been assigned to a pasture suitability group. These groups are based primarily on the suitability of the soil for certain pasture or hayland species, management needs, and potential productivity. The principal criteria for assigning a soil to a pasture suitability group include depth, drainage class, texture, structure, permeability, available water capacity, landscape position, and special internal features. Detailed interpretations for each pasture suitability group in the county are provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service. General descriptions of the pasture suitability groups in this county are provided in the following paragraphs. The descriptions include limitations affecting the use of the soils for pasture or hayland and a list of suitable plant species. The species are selected based on yield potential, adaptability to the site, palatability, and relative ease of establishment.

Group A.—The soils in this group receive additional moisture from runoff or flooding. All climatically adapted grasses and legumes are suitable, but only plants that are capable of utilizing the extra moisture are recommended.

The soils in this group are artificially drained or have a water table that is seasonally high for only short periods. Examples are Badger, Crossplain, Lamoure, Lowe, Minnewasta, and Minnewaukan soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth brome, orchardgrass, and switchgrass. Maintaining plant vigor is the major management concern. Proper grazing use, including deferred grazing and timely harvesting, helps to maintain plant vigor. Applications of fertilizer may also be needed. Surface compaction may be a concern during wet periods. Deferring use during these periods helps to minimize compaction and maintain tilth.

Group B1.—The soils in this group receive additional moisture from runoff or flooding. Because of the excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained and do not have a water table that is seasonally high for prolonged periods. Examples are Baltic and Marysland soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or haying during these periods can minimize compaction and improve plant vigor.

Group B2.—The soils in this group receive additional moisture from runoff. Because of the excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained. Examples are Hoven, Oldham, Parnell, Tetonka, Tonka, and Worthing soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The major management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or haying during these periods can minimize compaction and improve plant vigor.

Group C.—The soils in this group have a claypan subsoil and typically have a high content of soluble salts in the lower part of the subsoil and in the underlying material. The restricted root zone limits the selection and productivity of climatically adapted grasses and legumes.

Dudley soils are in this group. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, green needlegrass, intermediate wheatgrass, pubescent wheatgrass, smooth brome, and western wheatgrass. The major management concerns are the accumulation of excess salts, surface compaction during wet periods, and a slow rate of water infiltration. Proper grazing use, deferred grazing, and proper hayland management are needed to maintain a healthy plant community. Additions of fertilizer may also be needed.

Group D1.—The soils in this group have a moderately deep root zone and a limited available water

capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to somewhat poorly drained and are moderately deep over sand and gravel. Divide and Fordville soils are examples. The somewhat poorly drained soils and some of the moderately well drained soils have a water table that is seasonally high for short periods and are calcareous at or near the surface. The species that are most suitable in areas of these soils include alfalfa, intermediate wheatgrass, and smooth brome. The major management concerns are overcoming droughtiness, which is caused by the limited available water capacity, and maintaining plant vigor. Applications of fertilizer may also be needed. Proper hayland management and proper grazing use, including deferred grazing or a planned grazing system, help to maintain plant vigor.

Group D2.—The soils in this group have a shallow root zone and a very low available water capacity, which limit the selection of climatically adapted grasses.

The soils in this group are excessively drained to moderately well drained and are shallow over sand and gravel. Delmont and Renshaw soils are examples. The species that are most suitable in areas of these soils include crested wheatgrass and pubescent wheatgrass. Maintaining the plant community can be difficult because of the extreme droughtiness and the shallow root zone. Proper grazing use, deferred grazing, a planned grazing system, and timely harvesting help to maintain plant vigor.

Group E.—The soils in this group contain a high content of soluble salts in the underlying material. The unfavorable root zone limits the selection and productivity of climatically adapted grasses and legumes.

Beadle and Stickney soils are in this group. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth brome, and switchgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group F.—The soils in this group are suited to all climatically adapted grasses and legumes, but bunch-type grass species are not recommended in areas where the slope is 6 percent or more.

The soils in this group include Barnes, Brandt, Clarno, Cubden, Davison, Hetland, Houdek, Poinsett, and Vienna soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth brome, switchgrass, and orchardgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group G.—The soils in this group are calcareous within a depth of 10 inches. They range from gently sloping to moderately steep. The selection and productivity of climatically adapted grasses and legumes are limited by the slope, the high content of lime, and the hazard of erosion.

The soils in this group include Betts, Buse, and Ethan soils. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and smooth brome. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group H.—The soils in this group are susceptible to erosion. Also, a limited available water capacity restricts the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Blendon, Egeland, Embden, Henkin, and Maddock soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, indiangrass, intermediate wheatgrass, smooth brome, and switchgrass. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group I.—The soils in this group have an unfavorable root zone and a very slow rate of water infiltration, which limit the selection and productivity of climatically adapted grasses and legumes.

Sinai soils are in this group. The species that are most suitable in areas of these soils include alfalfa, green needlegrass, intermediate wheatgrass, smooth brome, switchgrass, and big bluestem. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group J.—The soils in this group are characterized by excessive salinity and alkalinity, which severely limit the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Durrstein, Holmquist,

and Playmoor soils. The species that are most suitable in areas of these soils include tall wheatgrass and western wheatgrass. The major management concern is maintaining the desirable plant community. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management help to maintain plant vigor and ensure the survival of the stand.

Group K.—The soils in this group receive additional moisture from runoff. They are suited to all of the climatically adapted grasses and legumes.

The soils in this group include Bon, Bonilla, Brookings, Prosper, and Waubay soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, orchardgrass, smooth brome, and switchgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group NS.—The soils in this group are generally not suitable for pasture or hayland plantings because they are steep, are very shallow to gravel, are sandy and have a low content of organic matter, are very strongly saline or alkaline, are clayey and have a dense subsoil, are stony or very stony, or are subject to ponding. Examples are Jerauld, Sioux, Southam, Talmo, and Worthing soils.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 and IIIe-6.

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this survey.

Rangeland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation is mainly grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation in any one area are determined by the soil, topography, climate, past use, and management.

All of the county was rangeland before the first permanent settlers arrived. Currently, about 11 percent of the county supports native vegetation (USDA, 1987). This rangeland supplies a portion of the forage for livestock in the county. Approximately 67 percent of the farm and ranch income in the county is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). Most of the livestock enterprises are cow-calf operations. Some are yearling operations, and some combine cow herds with yearlings. This latter practice permits greater flexibility in adjusting livestock numbers during periods of drought. Sheep are raised in limited numbers throughout the county and are often run in combination with cow herds. The rangeland is generally grazed from May to October. The forage provided by rangeland is generally supplemented by crop aftermath and tame pasture plants, such as intermediate wheatgrass and smooth brome. In winter the forage is supplemented by protein concentrate and hay.

Kingsbury County is part of the tall grass prairie. The native vegetation is dominated by tall and mid grasses and forbs. Common tall grass species include big bluestem, switchgrass, and prairie dropseed. Mid grasses include little bluestem, sideoats grama, and needlegrasses. Goldenrod and prairie-clover are common forbs. The tall grass prairie consists of cool- and warm-season plants, which provide high-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and include such plants as porcupinegrass. The warm-season plants grow mostly during June, July, and August and include such plants as big bluestem. The cool-season grasses may start growing again in September and October if rainfall is adequate.

The native vegetation in many parts of the county is producing below its potential because of past management. The tall grasses and some of the mid grasses have been replaced by less desirable plants. In many areas of the county, the past misuse of the native vegetation has resulted in an invasion of cool-season tame grasses, such as smooth brome and Kentucky bluegrass. As a result, the amount of available forage is reduced. In most areas, however, enough of the original plants remain for the reestablishment of high-quality native plants if good grazing management practices are applied.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the

environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map.

The plants within the native plant community are sometimes grouped as decreasers, increasers, and invaders, depending on their response to grazing pressure. Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by the grazing animal. Invaders are plants that are not part of the original plant community but invade because of some kind of disturbance or continued overgrazing. Some invader plants have little or no value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in abundance, and restricting grazing to the summer would cause them to decrease.

Table 7 shows, for nearly all of the soils, the range site; the composition of species in the potential natural plant community; and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaf, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in excellent condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation. It is in good condition if the percentage is 51 to 75, in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. Such measures include proper stocking rates and rotation or deferred rotation grazing systems. These systems provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock.

The soils in the county are assigned to 17 different range sites. These range sites are described in the following paragraphs.

Clayey range site. The potential native vegetation is a mixture of tall and mid grasses interspersed with a variety of forbs. Big bluestem and little bluestem, which are warm-season grasses, make up about 50 percent of the vegetation in about equal proportions. Needlegrasses and western wheatgrass are the dominant cool-season grasses. They make up about 30 percent of the vegetation. Other grasses that occur in lesser amounts include sideoats grama, blue grama, and grasslike sedges. Forbs, such as sageworts, heath aster, false boneset, and yarrow, are common but generally make up less than 10 percent of the vegetation.

The major management concern on this site is maintaining the most productive grasses. Big bluestem, little bluestem, and needlegrasses rapidly lose their productive capacity after continued overgrazing because of their palatability to livestock. If overgrazing is allowed, western wheatgrass, sideoats grama, and blue grama increase in abundance. If overgrazing continues, Kentucky bluegrass, blue grama, or both become dominant and the production of short grasses is limited. The most productive grasses can be

maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Claypan range site. The potential native vegetation is a prairie of mid and tall grasses interspersed with some forbs. Western wheatgrass and green needlegrass, which are cool-season species, are codominant species. They make up about 60 percent of the vegetation. Big bluestem and switchgrass, which are warm-season species, make up approximately 20 percent of the vegetation. Blue grama and sedges are common understory grasses but occur in small amounts. Forbs, such as sageworts, heath aster, and scarlet globemallow, occur on this site but make up only about 5 percent of the vegetation.

The major management concern on this site is maintaining the most productive plants. Big bluestem, switchgrass, and green needlegrass rapidly decrease in abundance after continuous overgrazing because of their palatability to livestock. Western wheatgrass initially increases in abundance, but if overgrazing continues this species is replaced by short grasses, such as blue grama and Kentucky bluegrass. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Closed Depression range site. The potential native vegetation is dominated by western wheatgrass, which makes up about 70 percent of the vegetation, and by sedges, which make up about 10 percent. The plant community is not stable, however, because of alternating wetness and dryness. Because this site is on flat or concave bottoms of closed depressions, it is excessively wet or ponded during wet periods and can be droughty during abnormally dry periods.

The major management concern on this site is maintaining the most desirable plant community. If continued overgrazing is allowed, the extent of western wheatgrass is reduced and that of short grasses, such as saltgrass and Kentucky bluegrass, increases. Also, trampling by livestock hinders natural drainage. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of the desired plants and during wet periods.

Limy Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 40 percent of the vegetation. A combination of big bluestem, indiangrass, switchgrass, needlegrasses, and western wheatgrass makes up about 40 percent of the vegetation. Prairie dropseed makes up about 10 percent of the vegetation; sideoats grama and blue grama, 10 percent; and sedges and forbs, 10 percent. This site is less productive than the Subirrigated site because of the seasonal high water table and the high content of lime in the soils.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem, indiangrass, switchgrass, and prairie dropseed lose their productive capacity and thin out after continuous grazing because they are preferred by livestock. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, Kentucky bluegrass, sedges, and downy brome become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Loamy Overflow range site. The potential native vegetation on this site is tall, warm-season prairie grasses. Big bluestem, indiangrass, and switchgrass make up about 70 percent of the vegetation. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 15 percent. Forbs, such as Maximilian sunflower, stiff sunflower, tall gayfeather, and goldenrod, make up about 10 percent. Shrubs, such as leadplant and wild rose, and sedges make up about 5 percent.

The major management concern on this site is maintaining the extent of the most productive grasses and forbs. Big bluestem, switchgrass, Maximilian sunflower, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, Kentucky bluegrass, a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Saline Lowland range site. The climax plant cover on this site is made up of species that are tolerant of saline conditions. Cordgrasses commonly are dominant and may make up as much as 50 percent of the vegetation. Nuttall alkaligrass, switchgrass, western wheatgrass, alkali muhly, and foxtail barley are also common. Saltgrass is the most abundant short grass.

The grasses typically are not dominant but make up a relatively small percentage of the vegetation on this site. Sedges and forbs, such as seepweed and glasswort, occur in small amounts. Woody plants are rare. The soils on this site generally have a seasonal high water table within a depth of 1 to 4 feet. Some small areas that are included with this site do not have a water table high enough to support cordgrasses.

The major management concern on this site is maintaining the extent of the most productive grasses. Cordgrass and Nuttall alkaligrass rapidly lose vigor and density if continued overgrazing is allowed. As the extent of these species decreases, saltgrass becomes the principal grass species on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Saline Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 45 percent of the vegetation. Big bluestem, indiangrass, switchgrass, and sedges are also common. Forbs are common but generally make up only about 5 percent of the vegetation.

The major management concern on this site is maintaining the extent of the most productive plants. The plant community is very fragile. Big bluestem, little bluestem, indiangrass, and switchgrass rapidly lose their productive capacity and thin out after continuous grazing because livestock prefer these plants. As the extent of these plants decreases, inland saltgrass and foxtail barley become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Sandy range site. The potential native vegetation on this site is dominated by tall and mid, warm-season grasses. Big bluestem, sand bluestem, and prairie sandreed make up about 40 percent of the vegetation. Sideoats grama and little bluestem make up about 25 percent. Needleandthread, porcupinegrass, or both make up about 10 percent of the vegetation. Forbs, such as heath aster, scurfpea, and perennial sunflowers, and shrubs, such as wild rose and leadplant, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. The extent of sand bluestem and porcupinegrass decreases after continuous grazing because the livestock prefer these plants. The extent of prairie sandreed, needleandthread, little bluestem, and sideoats grama initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grama and Kentucky bluegrass. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Shallow Marsh range site. This site is ponded in spring and early summer. The potential native vegetation is water-tolerant, tall prairie grasses and sedges. Rivergrass and slough sedge make up about 70 percent of the vegetation. Cattails, common spikesedge, prairie cordgrass, and reedgrass make up about 20 percent. Forbs, such as smartweed and waterplantain, make up about 5 percent.

The major management concern on this site is maintaining the extent of the most productive plants. If continued overgrazing is allowed, bluejoint reedgrass and slough sedge are replaced by spikesedge and other grasslike plants, which are less palatable to livestock. An increase in the abundance of the less palatable vegetation results in a loss of available forage. The extent of the most productive plants can be maintained by using proper stocking rates and by using a deferred grazing program, which provides rest periods during the key growing season of these plants.

Shallow to Gravel range site. The potential native vegetation on this site is mid prairie grasses. Needleandthread, which is a cool-season grass, makes up about 45 percent of the vegetation. Warm-season grasses make up about 50 percent. They include little bluestem, plains muhly, and prairie dropseed, which make up 25 percent of the vegetation, and blue grama and hairy grama, which make up 10 percent. Sedges, forbs, and shrubs make up about 15 percent of the vegetation.

The major management concern on this site is maintaining the extent of the most productive grasses. Needleandthread, little bluestem, plains muhly, and prairie dropseed rapidly thin out if overgrazing is allowed. When the extent of these grasses decreases, the extent of sedges and blue grama or hairy grama increases. If overgrazing continues, the productivity of the site is greatly reduced. The extent of the most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Silty range site. The potential native vegetation on

this site is tall and mid grasses and a large number of forbs. Cool-season grasses make up about 25 percent of the vegetation. They include green needlegrass, porcupinegrass, and bearded wheatgrass. Warm-season grasses, such as little bluestem, big bluestem, prairie dropseed, and indiangrass, make up about 55 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, stiff sunflower, heath aster, and prairie-clover, and shrubs, such as leadplant, rose, and western snowberry, make up about 20 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. If overgrazing is allowed, the extent of big bluestem, indiangrass, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. Little bluestem and sideoats grama initially increase after continuous grazing. If continuous overgrazing is allowed, however, short grasses, such as blue grama, annual bromes, and bluegrasses, become the dominant plants. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Subirrigated range site. The potential native vegetation on this site is dominantly tall, warm-season grasses. Big bluestem is the dominant warm-season grass. It makes up about 60 percent of the vegetation. Prairie cordgrass, switchgrass, indiangrass, and little bluestem make up about 20 percent. Forbs, such as American licorice, Maximilian sunflower, downy gentian, Canada milkvetch, heath aster, and Missouri goldenrod, make up about 20 percent.

The major management concern on this site is maintaining the extent of the most productive tall grasses. After continuous grazing, the extent of big bluestem, indiangrass, switchgrass, and forbs, such as Maximilian sunflower, decreases because the livestock prefer these plants. Little bluestem, sideoats grama, and sedges initially increase after continuous grazing. After continuous overgrazing, however, short grasses, such as Kentucky bluegrass, downy brome, and sedges, become the dominant plants. Low forage production is the result. The extent of the most productive tall grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Western wheatgrass is the principal mid grass. It makes up about 55 percent of the vegetation. Blue grama, the principal short grass, makes up about 25 percent. Buffalograss, saltgrass, and sedges occur in smaller amounts. Forbs, such as sagewort, heath aster, broom snakeweed, and woody plantain, generally make up less than 5 percent of the vegetation. Pricklypear is the dominant shrub on this site, but it makes up only a small percentage of the plant community.

The major management concern on this site is maintaining the extent of the most productive grasses. If overgrazing is allowed, western wheatgrass is replaced by blue grama, buffalograss, and saltgrass. If overgrazing continues, a considerable amount of the surface will be left bare, especially during dry periods. During wet periods, overgrazed areas may be overrun by weeds. The most productive grasses can be maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Thin Upland range site. The potential native vegetation on this site consists of tall and mid grasses and a large number of forbs. Warm-season grasses make up 65 percent of the vegetation. These include little bluestem, which makes up 35 percent of the vegetation; prairie dropseed, big bluestem, and plains muhly, which make up 25 percent; and sideoats grama, which makes up 5 percent. Cool-season grasses, such as green needlegrass, porcupinegrass, and needleandthread, make up about 15 percent. Forbs, such as pasqueflower, dotted gayfeather, and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. Indiangrass, prairie dropseed, big bluestem, porcupinegrass, and plains muhly lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The extent of little bluestem, sideoats grama, and needleandthread initially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. Needleandthread, plains muhly, and sideoats grama are the dominant mid grasses. These species make up about 70 percent of the vegetation. Short grasses, such as blue grama and hairy grama, and sedges make up about 20 percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, and shrubs, such as

leadplant and wild rose, make up about 10 percent.

The main management concern on this site is maintaining a good stand of grasses. If overgrazing is allowed, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is subject to erosion. A productive cover of grasses can be maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Wetland range site. This range site has the potential to produce a luxuriant stand of grasses that tolerate a high water table. Because these sites are often under water during the spring, their use is limited to summer and fall. Prairie cordgrass is the dominant species. It makes up about 60 percent of the vegetation. Reedgrasses, reed canarygrass, switchgrass, Canada wildrye, bluegrasses, and sedges also grow on this site. They make up about 40 percent of the vegetation. Forbs, such as asters, waterhemlock, and giant goldenrod, and shrubs, such as indigo amorpha and willows, generally occur in small amounts.

The major management concern on this site is maintaining the most productive plants. If continued overgrazing is allowed, the climax grasses lose vigor and density and sedges, rushes, bluegrasses, and saltgrass increase or invade. A less productive plant community results. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of these plants.

Wet Meadow range site. This range site has the potential to produce a luxuriant stand of sedges and mid or tall grasses. Sedges are the dominant species. They make up about 40 percent of the vegetation. Tall grass species, such as reedgrasses, prairie cordgrass, and reed canarygrass, also make up about 40 percent. Mid grasses, such as western wheatgrass and bluegrass, occur on the site but are not dominant. Forbs, such as smartweed, aster, and milkweed, are common but generally make up only about 5 percent of the vegetation. A few willows also grow on this site.

The major management concern on this site is maintaining the most productive grasses and sedges. Some areas are not usable by livestock during the spring and early summer because they are commonly ponded for about 4 to 8 weeks after periods of snowmelt or heavy rainfall. If grazing is allowed during these periods, surface compaction may become a problem. If continued overgrazing is allowed, the extent of the tall grasses and the more palatable sedges decreases, the less palatable spikesedge and rushes increase, and weedy grasses, such as foxtail barley, invade. Low forage production is the result. The most productive plants can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of these plants. Deferring grazing during wet periods helps to prevent surface compaction.

Native Woodland, Windbreaks, and Environmental Plantings

Thomas A. Hurford, resource conservationist, Natural Resources Conservation Service, helped prepare this section.

Native trees and shrubs in Kingsbury County grow mainly on the wet fringes adjacent to drainageways, potholes, and lakes. These areas consist mainly of Baltic, Bon, Cubden, Davison, Holmquist, Lamoure, La Prairie, Lowe, Marysland, Minnewasta, and Minnewaukan soils. Peachleaf willow, sandbar willow, and eastern cottonwood are the predominant species. Scattered clumps of American plum, western snowberry, and common chokecherry grow on a variety of soils throughout the county.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. They protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife. They may consist of one or more rows of adapted trees and shrubs.

Farmstead and feedlot windbreaks are planted to protect buildings and livestock from the severe winter weather that is common in Kingsbury County. In addition, these plantings provide winter cover for wildlife. They also help to beautify and screen houses and other buildings and to abate noise. Farmstead or feedlot windbreaks generally consist of multiple rows of adapted trees and shrubs. Many of the older plantings in the county have been neglected and are in need of renovation. Renovation may include planting additional trees adjacent to the existing windbreaks and controlling grasses within the older windbreaks. Competition from grass species, such as smooth brome, is a major factor contributing to the decline of windbreaks in Kingsbury County (fig. 10). Competition from unwanted species can be controlled with herbicides or tillage.

To ensure plant survival, locally adapted planting stock should be used and planted in a properly prepared site. If possible, the site should be one on which summer fallowing was practiced during the year prior to planting. Table 8 shows suitable trees and shrub species for planting as well as the expected 20-

Figure 10.—Competition from undesirable plants is under control in this windbreak, which is being established in an area of Renshaw-Fordville loams, 2 to 6 percent slopes.

year height of the species on various soils in the county.

At the end of each description under the heading "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this survey, the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. The windbreak suitability groups in this survey area are described in the following paragraphs.

Group 1.—These soils are well suited to woody plantings. They are on foot slopes and high flood plains. They receive additional moisture from runoff and flooding. Some areas are subirrigated. All climatically suited trees and shrubs grow well.

This group consists mainly of loamy, silty, and clayey, somewhat poorly drained to well drained soils that are deep and very deep. Available water capacity is moderate or high. The fine sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils in this group are Bon, Bonilla, Brookings, Cubden, Davison, Divide, Embden, La Prairie, Prosper, and Waubay soils.

Group 2.—The soils in this group are well suited to woody plantings. They are on toe slopes and low flood plains. They receive additional moisture from runoff or

have a high water table within the root zone. All climatically suited trees and shrubs grow well.

This group consists of deep and very deep, silty, loamy, and clayey, poorly drained and somewhat poorly drained soils. Available water capacity is high. The sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils in this group are Badger, Crossplain, Lamoure, and Minnewaukan soils.

Group 3.—The soils in this group are well suited to woody plantings. They are on summits, back slopes, and foot slopes. Except for those trees and shrubs that require abundant moisture, all climatically suited trees and shrubs grow well.

This group consists of deep and very deep, loamy and silty, well drained soils. Available water capacity is moderate or high. The susceptibility to water erosion ranges from slight in the nearly level areas to severe in the strongly sloping areas. The susceptibility to wind erosion ranges from slight to severe. Typical soils in this group are Barnes, Brandt, Clarno, Houdek, Poinsett, and Vienna soils.

Group 4.—The soils in this group are fairly well suited to woody plantings. They are on summits, back slopes, and foot slopes. Most of the climatically suited trees and shrubs grow well; however, maximum growth is not possible because of the limited root development.

This group consists of moderately deep, deep, and very deep, clayey soils and clayey soils that have a surface layer of loamy and silty material. The soils are moderately well drained and well drained. Available water capacity is low or moderate in the more clayey soils and moderate or high in the silty and loamy soils. Soils having accumulations of salts in the lower part of the subsoil also are in this group. The clayey soils are subject to severe wind erosion. The moderately sloping and strongly sloping soils are subject to severe water erosion. Typical soils in this group are Beadle, Hetland, Sinai, and Stickney soils.

Group 5.—The soils in this group are well suited to woody plantings. They are on summits, shoulder slopes, back slopes, and foot slopes. All climatically suited trees and shrubs grow well, except those that require abundant moisture.

This group consists mainly of deep and very deep, loamy and sandy, well drained and somewhat excessively drained soils. Available water capacity generally is low or moderate. These soils are subject to severe or very severe wind erosion. Typical soils in this group are Blendon, Egeland, Henkin, and Maddock soils.

Group 6.—The soils in this group are poorly suited to woody plantings. They are on summits, back slopes, and foot slopes. No trees and shrubs grow well on the soils in this group. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of silty and loamy, well drained and somewhat excessively drained soils that are moderately deep to bedrock or are shallow or moderately deep to sand and gravel. Available water capacity is low or moderate. The moderately sloping and strongly sloping soils are subject to severe erosion. Typical soils in this group are Delmont, Fordville, and Renshaw soils.

Group 7.—The soils in this group are poorly suited to woody plantings. No trees or shrubs grow well. Coniferous trees and shrubs are better suited than deciduous trees and shrubs. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, sandy, somewhat excessively drained and excessively drained soils. Available water capacity is very low or low. These soils are subject to very severe wind erosion. None of the soils in Kingsbury County are assigned to this group.

Group 8.—The soils in this group are poorly suited to woody plantings. They are on shoulder slopes. No trees and shrubs grow well. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, loamy and silty, well drained soils that contain enough calcium carbonate at or near the surface to adversely affect the growth and survival of trees and shrubs. Available water capacity is moderate or high. These soils are subject to severe wind erosion and water erosion. Typical soils in this group are Betts, Buse, Ethan, and Rusklyn soils.

Group 9.—These soils are poorly suited to woody plantings. They have a dense claypan subsoil and an excessive amount of salt in the lower part of the subsoil. They are on summits, back slopes, and foot slopes. No trees and shrubs grow well because of the adverse effect of the dense claypan subsoil and the salts.

This group consists of deep and very deep, silty and loamy, moderately well drained soils. Available water capacity is low or moderate. Dudley soils are typical of this group.

Group 10.—The soils in this group generally are unsuited to woody plantings. The soils are shallow to bedrock, very shallow to gravel, very saline, very alkaline, stony, or very wet. Specialized plantings for

wildlife, recreation, or beautification may be established in some areas. The most favorable sites should be selected, and only those trees and shrubs that have the best potential to survive and grow should be planted.

The soils in this group have a wide range of texture, depth, drainage, available water capacity, permeability, and slope characteristics. Susceptibility to water erosion and wind erosion ranges from slight to very severe. Typical soils in this group are Baltic, Buse, Durrstein, Jerauld, Holmquist, Hoven, Lowe, Marysland, Minnewasta, Oldham, Parnell, Playmoor, Renshaw, Sioux, Southam, Talmo, Tetonka, Tonka, and Worthing soils and the gravelly Orthents.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, the South Dakota Agricultural Experiment Station, or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Connie M. Vicuna, biologist, Natural Resources Conservation Service, helped prepare this section.

Kingsbury County provides a variety of wildlife habitat types because of the diversity of land uses, including cropland interspersed with wetlands, farmstead and field windbreaks, rangeland, and pasture. Wildlife species include white-tailed deer, pheasants, ducks, geese, other waterbirds, gray partridge, doves, cottontail rabbits, squirrels, beaver, mink, muskrats, fox, coyotes, raccoon, and skunks. Prairie chickens and sharptail grouse also inhabit areas of the county. Also, fisheries are associated with the abundant lakes and streams.

Wetlands are numerous throughout the county. They include prairie potholes and the flood plains along many streams. The size of these wetlands ranges from less than 0.1 acre to 1,000 acres. Water regimes in the

county are also variable and include temporary and permanent bodies of water. The variety and number of wetland areas are extremely attractive to waterfowl. Ducks, geese, grebes, herons, and other waterbirds inhabit the survey area from spring through fall.

Rangeland habitat occurs throughout the survey area, but it is more abundant in the loamy glacial till area of the western part of the county. The grasslands in this part of the county are intermixed with wetlands and provide the type of habitat that makes this area important for waterfowl production.

Woody habitat is available in areas of bottom land and on adjacent slopes, along streams and rivers, and around some wetlands and lakes. Farmstead windbreaks also contribute woody habitats. These shrubby and wooded areas are not abundant, but they provide important vegetation for food and cover for many species of wildlife.

The county has numerous public wildlife management areas.

Soils affect the kind and amount of vegetation that is available for wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing specific elements of wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining the habitat elements; and in determining the intensity of management needed for each habitat element.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. They are primarily food sources for wildlife, but small grain crops also provide some nesting cover. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, sorghum, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. They provide nesting and roosting cover. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are intermediate wheatgrass, bromegrass, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. They provide food, nesting cover, and escape cover. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of native herbaceous plants are big bluestem, switchgrass, indiangrass, green needlegrass, and sideoats grama.

Planted woody plants include trees and shrubs that require cultivation before and during establishment. These plants provide fruit, buds, twigs, bark, and foliage and are important as food sources, nesting cover, winter cover, and escape cover. Soil properties and features that affect the growth of these plants include depth of the root zone, available water capacity, salinity, and soil moisture. Examples of planted woody plants are green ash, hackberry, caragana, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. They provide food for wildlife and are important as winter cover and escape cover. Soil properties and features that affect the growth of these trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are elm, cottonwood, ash, bur oak, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness.

Eastern redcedar is the primary example of these plants in the survey area.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are gooseberry, snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. They provide food and nesting cover. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, sloughgrass, whitetop, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Additional information concerning maintaining and managing specific wildlife species is available at the local office of the Natural Resources Conservation Service; the South Dakota Department of Game, Fish, and Parks; or the United States Fish and Wildlife Service.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the

indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Large stones interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are

excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to

layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, and large stones affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, and slope affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

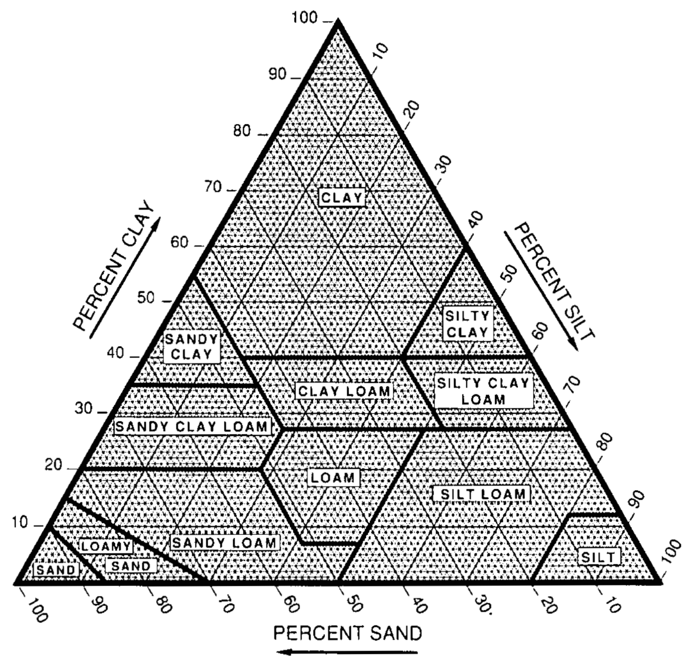

Figure 11.—Percentages of sand, silt, and clay in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and

clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for

fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity,

infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed

that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploborolls (*Hapl*, meaning minimal horizonation, plus *boroll*, the suborder of the Mollisols that has a cool temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Udic Haploborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed Udic Haploborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Badger Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains

Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Badger silty clay loam (fig. 12), 400 feet south and 120 feet east of the northwest corner of sec. 4, T. 111 N., R. 53 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 20 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong medium prismatic structure parting to strong coarse and medium subangular blocky; very hard, firm, very sticky and very plastic; few very fine roots; shiny films on faces of peds; few fine concretions of iron and manganese oxide; neutral; gradual smooth boundary.

Bt2—20 to 35 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate coarse and medium subangular blocky; very hard, firm, very sticky and very plastic; shiny films on faces of peds; few fine concretions of iron and manganese oxide; neutral; gradual wavy boundary.

BCg—35 to 46 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium prominent brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; very hard, friable, sticky and plastic; slightly alkaline; gradual wavy boundary.

Cg1—46 to 55 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; many medium prominent brownish yellow (10YR 6/6) and distinct light gray (10YR 7/1) mottles; massive; very hard, friable, slightly sticky and slightly plastic; slightly alkaline; clear wavy boundary.

2Cg2—55 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many medium prominent brownish yellow (10YR 6/6) and distinct light gray (10YR 7/1) mottles; massive; very hard, friable, slightly sticky and slightly plastic; common fine dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches
Depth to carbonates: 35 to more than 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a Bk horizon; some pedons do not have a 2C horizon.

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, clay loam, or loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 or 2
Texture—mainly clay or silty clay; silty clay loam or clay loam in some pedons

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam or silt loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 6
Texture—clay loam, sandy clay loam, or loam

Baltic Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Baltic silty clay loam, 1,850 feet east and 375 feet north of the southwest corner of sec. 24, T. 112 N., R. 58 W.

A—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common very fine tubular pores; slight effervescence; moderately alkaline; clear smooth boundary.

Bw—10 to 21 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; common fine accumulations of carbonate; strong

effervescence; about 1 percent pebbles; slightly alkaline; clear smooth boundary.

By—21 to 36 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common fine accumulations of carbonate; common fine irregular gypsum crystals; strong effervescence; about 1 percent pebbles; moderately alkaline; gradual wavy boundary.

Bk1—36 to 45 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; few fine prominent light gray (N 7/0) mottles; weak medium prismatic structure parting to weak medium and fine subangular blocky; very hard, firm, sticky and plastic; common very fine roots; common fine and medium accumulations of carbonate; strong effervescence; about 1 percent pebbles; moderately alkaline; gradual wavy boundary.

Bk2—45 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine prominent light gray (N 7/0) mottles; weak coarse and medium subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 50 inches
Carbonates: At the surface
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 20 to 55 inches
Other features: Some pedons do not have a Bk horizon; some pedons have a Cg horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silty clay, clay loam, or loam

Bw horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6 (2 to 4 moist)
Chroma—0 or 1
Texture—silty clay loam, silty clay, or clay

By horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6 (2 to 4 moist)
Chroma—0 or 1
Texture—silty clay, silty clay loam, or clay

Barnes Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 1 to 15 percent

Typical Pedon

Barnes loam, in an area of Barnes-Buse loams, 6 to 9 percent slopes, 80 feet east and 1,455 feet south of the northwest corner of sec. 26, T. 112 N., R. 54 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine and very fine roots; few very fine tubular pores; about 5 percent pebbles; slightly alkaline; abrupt smooth boundary.

Bw—7 to 13 inches; brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; about 5 percent pebbles; slightly alkaline; clear smooth boundary.

Bk—13 to 27 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; common fine and medium accumulations of carbonate; about 5 percent pebbles; strong effervescence; slightly alkaline; gradual wavy boundary.

C1—27 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 10 to 20 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, fine sandy loam, sandy loam, clay loam, sandy clay loam, or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—loam, clay loam, or sandy clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Beadle Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Till plains and moraines
Parent material: Clayey glacial till
Slope: 0 to 9 percent

Typical Pedon

Beadle loam, 0 to 2 percent slopes, 126 feet east and 2,613 feet south of the northwest corner of sec. 19, T. 110 N., R. 58 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine and very fine roots; about 2 percent pebbles; neutral; clear smooth boundary.

Bt—7 to 17 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; few very fine tubular pores; continuous shiny films on faces of peds; about 2 percent pebbles; slightly alkaline; clear wavy boundary.

Btk—17 to 21 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; few very fine tubular pores; discontinuous shiny films on faces of peds; few fine accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

Bk—21 to 31 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; few fine prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; many fine and medium accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C—31 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent strong brown (7.5YR 5/8) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots; common fine dark concretions of iron and manganese oxide; common fine and few medium accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 12 to 25 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 3
Texture—clay or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3
Texture—clay loam or clay

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or clay

Betts Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 9 to 20 percent

Typical Pedon

Betts loam, in an area of Ethan-Betts loams, 9 to 20 percent slopes, 2,590 feet east and 90 feet north of the southwest corner of sec. 33, T. 109 N., R. 57 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine and very fine roots; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

Bw—4 to 8 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; few fine irregular accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

BCk1—8 to 15 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; many fine and medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; common fine irregular accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

BCk2—15 to 31 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; many fine and medium prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; common fine irregular accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C—31 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium prominent strong brown (7.5YR 5/8) mottles; massive; hard, firm; common fine irregular accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 2 to 5 inches
Depth to carbonates: 0 to 3 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—loam or clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3
Texture—loam or clay loam

BCk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Blendon Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 2 to 6 percent

Typical Pedon

Blendon fine sandy loam, in an area of Henkin-Blendon fine sandy loams, 2 to 6 percent slopes, 1,850 feet south and 2,630 feet east of the northwest corner of

sec. 5, T. 110 N., R. 57 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable; common fine and very fine roots; few very fine tubular pores; slightly acid; abrupt smooth boundary.

Bw—8 to 22 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine and very fine roots; common very fine tubular pores; neutral; gradual wavy boundary.

C1—22 to 42 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable; few fine and very fine roots; common very fine tubular pores; slightly alkaline; gradual wavy boundary.

C2—42 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: 40 to more than 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam, loam, or sandy loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—fine sandy loam, sandy loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—loamy fine sand, sandy loam, loamy sand, fine sandy loam, gravelly sandy loam, gravelly fine sandy loam, sand, or fine sand

Bon Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Bon loam, in an area of Ethan-Bon, channeled, loams, 0 to 20 percent slopes, 1,300 feet east and 210 feet north of the southwest corner of sec. 5, T. 109 N., R. 56 W.

A—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; many very fine roots; few very fine tubular pores; about 1 percent pebbles; neutral; clear smooth boundary.

Bw1—8 to 14 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common very fine roots; few very fine tubular pores; about 1 percent pebbles; neutral; clear smooth boundary.

Bw2—14 to 20 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable; common very fine roots; few very fine tubular pores; few fine accumulations of carbonate; about 1 percent pebbles; slight effervescence; slightly alkaline; clear smooth boundary.

Bk1—20 to 32 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; few very fine roots; common very fine tubular pores; common fine accumulations of carbonate; about 1 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

Bk2—32 to 41 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; few very fine roots; many very fine tubular pores; common fine accumulations of carbonate; about 1 percent pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

Bk3—41 to 50 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable; few very fine roots; many very fine tubular pores; many fine and medium accumulations of carbonate; about 1 percent pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

Ab—50 to 56 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; slightly hard, friable;

few very fine roots; common very fine tubular pores; few fine accumulations of carbonate; about 1 percent pebbles; slight effervescence; moderately alkaline; gradual wavy boundary.

C—56 to 60 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; common fine prominent yellowish brown (10YR 5/8) and light gray (N 6/0) mottles; massive; hard, friable; few fine irregular accumulations of carbonate; about 2 percent pebbles; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 60 inches
Depth to carbonates: 0 to 20 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or very fine sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, silt loam, or very fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 7 (2 to 5 moist)
Chroma—1 to 3
Texture—loam, silt loam, fine sandy loam, or stratified fine sandy loam, silt loam, loam, clay loam, or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 7 (2 to 5 moist)
Chroma—1 to 3
Texture—clay loam, loam, fine sandy loam, or stratified loam, clay loam, or fine sandy loam; layers of loamy fine sand, silt loam, or silty clay loam in some pedons

Bonilla Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Bonilla loam, in an area of Clarno-Bonilla loams, 0 to 2 percent slopes, 2,380 feet south and 240 feet east of the northwest corner of sec. 4, T. 112 N., R. 57 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, friable; many very fine roots; about 1 percent pebbles; slightly acid; abrupt smooth boundary.

Bw1—9 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable; many very fine roots; few fine tubular pores; about 1 percent pebbles; neutral; gradual smooth boundary.

Bw2—16 to 21 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable; many very fine roots; common very fine tubular pores; about 1 percent pebbles; neutral; abrupt wavy boundary.

Bw3—21 to 25 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; about 2 percent pebbles; slightly alkaline; clear wavy boundary.

Bk—25 to 30 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; common fine prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and medium tubular pores; common fine and medium accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

C1—30 to 42 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; slightly hard, friable; few fine accumulations of carbonate; about 3 percent pebbles; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—42 to 60 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; common fine prominent strong brown (7.5YR 5/8) and many fine prominent light gray (N 7/0) mottles; massive; slightly hard, friable; few fine accumulations of carbonate; about 4 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 50 to more than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, fine sandy loam, or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—6 or 7 (4 or 5 moist)
Chroma—1 to 3
Texture—loam, clay loam, silt loam, or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—6 or 7 (4 or 5 moist)
Chroma—1 to 4
Texture—loam, clay loam, or stratified silt loam, loam, or fine sandy loam with lenses of clay loam, silty clay loam, or loamy sand

Brandt Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loess or silty alluvium over glacial outwash
Slope: 2 to 6 percent

Typical Pedon

Brandt silty clay loam, 2 to 6 percent slopes, 1,210 feet east and 2,400 feet south of the northwest corner of sec. 3, T. 111 N., R. 53 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; slightly hard, friable; common very fine roots; few very fine tubular pores; slightly acid; abrupt smooth boundary.

Bw1—8 to 17 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; common very fine roots; many very fine tubular pores; neutral; gradual wavy boundary.

Bw2—17 to 23 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; common very fine roots; many very fine and fine tubular pores; about 2 percent pebbles; slightly alkaline; gradual wavy boundary.

Bk1—23 to 34 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; few very fine roots; common fine accumulations of carbonate; common very fine tubular pores; about 2 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

Bk2—34 to 41 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; few very fine roots; common very fine tubular pores; common fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

2C—41 to 60 inches; light yellowish brown (2.5Y 6/4), stratified gravelly loamy sand and gravelly sandy loam, light olive brown (2.5Y 5/4) moist; single grain; loose; 20 percent gravel; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 20 to 48 inches
Depth to contrasting or impervious layer: 40 to 60 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—loam, clay loam, silt loam, or silty clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, sand, gravelly loamy sand, gravelly sandy loam, gravelly loam, gravelly sand, very gravelly loamy sand, or very gravelly sand

Brookings Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Silty glacial till over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Brookings silty clay loam, in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 63 feet south and 200 feet east of the northwest corner of sec. 32, T. 112 N., R. 54 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; neutral; abrupt smooth boundary.

A—7 to 17 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; neutral; gradual wavy boundary.

Bw—17 to 25 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; slightly alkaline; clear wavy boundary.

Bk—25 to 39 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/3) moist; common fine prominent light gray (N 7/0) mottles; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual irregular boundary.

2C—39 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/3) moist; common fine prominent light gray (N 7/0) and strong brown (7.5YR 5/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting or impervious layer: 20 to 40 inches over loamy glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

Buse Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 3 to 20 percent

Typical Pedon

Buse loam, in an area of Buse-Barnes loams, 6 to 9 percent slopes, 202 feet west and 1,150 feet north of the southeast corner of sec. 35, T. 112 N., R. 53 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium and fine granular structure; slightly hard, firm; common very fine roots; about 3 percent pebbles; strong effervescence; slightly alkaline; abrupt smooth boundary.

Bk—9 to 25 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; common fine prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; few fine dark accumulations of iron and manganese oxide; common fine and medium accumulations of carbonate; about 4 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—25 to 40 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; common fine prominent strong brown (7.5YR 5/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; few fine dark accumulations of iron and manganese oxide; common fine accumulations of carbonate; about 5 percent pebbles; few shale chips; strong effervescence; moderately alkaline; diffuse wavy boundary.

C2—40 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent strong brown (7.5YR 5/8) and few fine distinct light gray (N 7/0) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fine dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—loam or clay loam

Clarno Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 0 to 15 percent

Typical Pedon

Clarno loam, in an area of Clarno-Ethan-Bonilla loams, 1 to 6 percent slopes, 45 feet south and 1,550 feet west of the northeast corner of sec. 1, T. 111 N., R. 57 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable; common fine and very fine roots; about 2 percent pebbles; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine and very fine roots; about 2 percent pebbles; slightly acid; clear smooth boundary.

Bw—12 to 25 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; few fine and very fine roots; few fine tubular pores; about 2 percent pebbles; neutral; gradual wavy boundary.

Bk—25 to 41 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (2.5Y 7/0) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; few fine and very fine roots; few fine tubular pores; common fine and medium accumulations of carbonate; 3 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C—41 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; common fine prominent strong brown (7.5YR 5/8) and common fine prominent light gray (2.5Y 7/0) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine tubular pores; 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 12 to 26 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or fine sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—2 or 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Crossplain Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium over loamy glacial till
Slope: 0 to 1 percent

Typical Pedon

Crossplain clay loam, in an area of Crossplain-Tetonka complex, 135 feet east and 950 feet south of the northwest corner of sec. 32, T. 111 N., R. 56 W.

A—0 to 10 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; about 2 percent pebbles; neutral; abrupt smooth boundary.

AB—10 to 14 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; about 2 percent pebbles; slightly acid; clear smooth boundary.

Bt1—14 to 25 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; common very discontinuous shiny films on faces of peds; about 2 percent pebbles; slightly acid; gradual wavy boundary.

Bt2—25 to 35 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to weak coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; few patchy shiny films on faces of peds; about 2 percent pebbles; neutral; gradual wavy boundary.

Bkg—35 to 53 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium prominent yellowish brown (10YR 5/8) and light gray (N 7/0) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine irregular soft masses of iron and manganese oxide; common fine accumulations of carbonate; 5 percent pebbles; strong effervescence; moderately alkaline; diffuse wavy boundary.

Cg—53 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; many fine and medium distinct light gray (N 7/0) and common prominent yellowish brown (10YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine irregular soft accumulations of iron and manganese oxide; few fine accumulations of carbonate; 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches
Depth to carbonates: 16 to 48 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1

Texture—clay loam, silt loam, silty clay loam, or loam

Bt horizon:

Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam or clay

Bk horizon:

Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 3
Texture—clay loam or loam

C horizon:

Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 3
Texture—clay loam or loam

Cubden Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 2 percent

Typical Pedon

Cubden silty clay loam, in an area of Cubden-Badger silty clay loams, 500 feet east and 1,250 feet north of the southwest corner of sec. 3, T. 112 N., R. 53 W.

A—0 to 10 inches, dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine roots; strong effervescence (7 percent calcium carbonate); slightly alkaline; abrupt smooth boundary.

Bk1—10 to 21 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine tubular pores; few fine accumulations and disseminated carbonates throughout; violent effervescence (17 percent calcium carbonate); moderately alkaline; gradual smooth boundary.

Bk2—21 to 28 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; few fine accumulations and disseminated carbonates throughout; violent effervescence (12 percent calcium carbonate); moderately alkaline; clear smooth boundary.

C—28 to 41 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; few fine faint light gray (N 7/0) mottles; massive; very hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; few fine accumulations of carbonate; strong effervescence (9 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

2Cy1—41 to 53 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent strong brown (7.5YR 5/8) and few fine faint light gray (N 7/0) mottles; massive; very hard, firm, slightly sticky and slightly plastic; common dark fine, medium, and coarse accumulations of gypsum; few fine accumulations of carbonate; about 2 percent pebbles; few shale chips; strong effervescence (9 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

2Cy2—53 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine prominent strong brown (7.5YR 5/8) and few fine distinct light gray (N 7/0) mottles; massive; very hard, firm, slightly sticky and slightly plastic; common dark fine accumulations of iron and manganese oxide; few fine accumulations of carbonate; common dark fine, medium, and coarse accumulations of gypsum; about 3 percent pebbles; few shale chips; strong effervescence (8 percent calcium carbonate); moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: 40 to more than 60 inches

A horizon:

Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

C horizon:

Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4

Texture—silty clay loam or silt loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Davison Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Davison loam, in an area of Davison-Crossplain complex, 130 feet north and 1,810 feet west of the southeast corner of sec. 15, T. 112 N., R. 57 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable; few fine and very fine roots; few very fine tubular pores; strong effervescence (11 percent calcium carbonate); slightly alkaline; abrupt smooth boundary.

Bk1—8 to 18 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable; few fine and very fine roots; common very fine tubular pores; few fine accumulations of carbonate; violent effervescence (26 percent calcium carbonate); moderately alkaline; gradual smooth boundary.

Bk2—18 to 24 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; few fine and very fine roots; few very fine tubular pores; few fine accumulations of carbonate; violent effervescence (25 percent calcium carbonate); moderately alkaline; clear wavy boundary.

C1—24 to 34 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, friable; few fine and very fine roots; few shale fragments; few fine accumulations of carbonate; strong effervescence (14 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

C2—34 to 48 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; slightly hard, friable; few fine accumulations of carbonate; about 2 percent pebbles; few shale fragments; strong effervescence (12 percent calcium carbonate); slightly alkaline; gradual wavy boundary.

Cy—48 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; slightly hard, friable; few fine accumulations of carbonate; common medium and coarse accumulations of gypsum; about 3 percent pebbles; few shale fragments; strong effervescence (12 percent calcium carbonate); slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 15 to more than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, very fine sandy loam, or silt loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loam, clay loam, or sandy loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—loam, sandy loam, fine sandy loam, silt loam, or clay loam; typically stratified

Delmont Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 15 percent

Typical Pedon

Delmont loam, in an area of Talmo-Delmont loams, 6 to 15 percent slopes, 2,180 feet south and 850 feet west of the northeast corner of sec. 9, T. 110 N., R. 56 W.

A—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common very fine roots; about 3 percent pebbles; neutral; clear smooth boundary.

Bw—9 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; common very fine roots; few very fine tubular pores; about 5 percent pebbles; slightly alkaline; clear wavy boundary.

2C1—18 to 45 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; about 45 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—45 to 60 inches; light yellowish brown (2.5Y 6/4) gravelly loamy sand, olive brown (2.5Y 4/4) moist; single grain; loose; about 20 percent gravel; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting or impervious layer: 14 to 20 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, very fine sandy loam, or silt loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, sandy loam, or fine sandy loam

2C horizon:
Hue—5YR to 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, gravelly loamy sand, very gravelly loamy sand, or very gravelly sand

Divide Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 3 percent

Typical Pedon

Divide loam, 350 feet south and 1,420 feet west of the northeast corner of sec. 32, T. 112 N., R. 56 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; few very fine roots; few fine accumulations of carbonate; about 2 percent pebbles; strong effervescence (6 percent calcium carbonate); slightly alkaline; abrupt smooth boundary.

Bk1—10 to 21 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable; few very fine roots; common very fine tubular pores; common fine and medium accumulations of carbonate; about 2 percent pebbles; violent effervescence (17 percent calcium carbonate); moderately alkaline; clear wavy boundary.

Bk2—21 to 26 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable; very fine roots; common fine dark stains (manganese oxide); few very fine tubular pores; common fine to coarse accumulations of carbonate; about 5 percent pebbles; violent effervescence (18 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

2C1—26 to 32 inches; light brownish gray (10YR 6/2) gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose; few fine accumulations of carbonate; about 20 percent gravel; strong effervescence (9 percent calcium carbonate); slightly alkaline; gradual wavy boundary.

2C2—32 to 41 inches; pale brown (10YR 6/3) gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose; about 25 percent gravel; strong effervescence (3 percent calcium carbonate); slightly alkaline; abrupt wavy boundary.

2C3—41 to 47 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; common fine faint very pale brown (10YR 7/4) and common fine distinct gray (10YR 6/1) mottles; single grain; loose; about 2 percent pebbles; strong effervescence (3 percent calcium carbonate); slightly alkaline; clear wavy boundary.

2C4—47 to 60 inches; light yellowish brown (2.5Y 6/4) loamy sand, light olive brown (2.5Y 5/4) moist; common fine prominent light gray (N 7/0) and yellowish brown (10YR 5/6) mottles; single grain;

loose; common fine dark stains (manganese oxide) on undersides of pebbles; about 2 percent pebbles; strong effervescence (3 percent calcium carbonate); slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, sandy loam, sandy clay loam, silt loam, or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (3 to 7 moist)
Chroma—1 to 4
Texture—loam, clay loam, or sandy clay loam

2C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—stratified sand to gravelly sand

Dudley Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Very slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Dudley silt loam, in an area of Dudley-Jerauld silt loams, 90 feet south and 1,000 feet east of the northwest corner of sec. 9, T. 112 N., R. 58 W.

A—0 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; many very fine and fine roots; about 1 percent pebbles; neutral; clear wavy boundary.

E—6 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; soft, very friable; many very fine and fine roots; common very fine and fine tubular pores; about 1 percent pebbles; neutral; abrupt wavy boundary.

Btn1—9 to 11 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; coatings of grayish brown (10YR 5/2) silt loam on tops and sides of columns; moderate fine and medium columnar structure; very hard, very firm, sticky and plastic; many very fine and fine roots; common very fine and fine tubular pores; common discontinuous shiny films on vertical faces of peds; about 1 percent pebbles; slightly alkaline; clear wavy boundary.

Btn2—11 to 17 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and plastic; many very fine and fine roots; common discontinuous shiny films on vertical faces of peds; about 1 percent pebbles; moderately alkaline; clear wavy boundary.

Btnz—17 to 21 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and plastic; common very fine and fine roots; common distinct dark gray (10YR 4/1) discontinuous shiny films on vertical faces of peds; common fine and medium irregular salt masses; about 1 percent pebbles; moderately alkaline; clear wavy boundary.

Bz—21 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; common very fine and fine roots; common fine irregular salt masses; about 1 percent pebbles; strong effervescence; strongly alkaline; clear wavy boundary.

Bkz—30 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; common medium accumulations of carbonate; common fine irregular salt masses; about 1 percent pebbles; strong effervescence; strongly alkaline; gradual wavy boundary.

C—36 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent light gray (N 7/0) and strong brown (7.5YR 5/8) mottles; massive; very hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; few fine irregular salt masses; about 1 percent pebbles; strong effervescence; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Thickness of the surface soil: 4 to 11 inches
Depth to carbonates: 16 to 35 inches

Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 16 to 40 inches
A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam or loam
E horizon:
Hue—10YR
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silt loam or loam
Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam, clay loam, silty clay, or clay
Bz or Bkz horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—clay loam, silty clay loam, or clay
C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Durrstein Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Durrstein silt loam, 450 feet east and 2,050 feet north of the southwest corner of sec. 31, T. 110 N., R. 58 W.

E—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium platy structure parting to weak fine granular; slightly hard, friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

Btn1—2 to 5 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak fine and medium columnar structure parting to weak fine subangular blocky; very hard, very firm, sticky and plastic; common fine and very fine roots; coatings of gray (10YR 5/1) silty clay loam on tops and sides of columns; neutral; clear smooth boundary.

Btn2—5 to 12 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; common fine and very fine roots; thin continuous shiny films on vertical faces of peds; slightly alkaline; clear wavy boundary.

Btnkz—12 to 19 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, very firm, sticky and plastic; common very fine roots; common fine irregular accumulations of carbonate; many fine irregular nests of salts; strong effervescence; slightly alkaline; clear wavy boundary.

Bkzg1—19 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; few fine irregular accumulations of iron and manganese oxide; many medium and coarse irregular accumulations of carbonate; common fine irregular nests of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

Bkzg2—34 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common fine irregular accumulations of iron and manganese oxide; common medium and coarse irregular accumulations of carbonate; common fine irregular nests of salts; about 8 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

2Cg—45 to 60 inches; olive gray (5Y 4/2) sandy loam, dark olive gray (5Y 3/2) moist; massive; soft, very friable; common fine irregular accumulations of iron and manganese oxide; about 8 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 15 to 30 inches
Depth to carbonates: 5 to 15 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over sandy material
Depth to gypsum and other salts: 5 to 15 inches
E horizon:
Hue—10YR
Value—5 or 6 (3 or 4 moist)
Chroma—1 or 2
Texture—silt loam or loam

Btn horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—clay, clay loam, or silty clay

Bzg or Bkzg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 (2 to 5 moist)
Chroma—1 or 2
Texture—silty clay, clay loam, silty clay loam, or clay

Cg or 2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—clay, silty clay, clay loam, or silty clay loam; coarser textured material below a depth of 40 inches

Egeland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains and moraines
Parent material: Loamy glaciofluvial sediments
Slope: 0 to 9 percent

Typical Pedon

Egeland sandy loam, in an area of Egeland-Embden complex, 2 to 6 percent slopes, 1,380 feet east and 1,940 feet south of the northwest corner of sec. 34, T. 109 N., R. 55 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; few fine and very fine roots; neutral; abrupt smooth boundary.

A—6 to 9 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, very friable; few fine and very fine roots; neutral; clear smooth boundary.

Bw—9 to 16 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable; few fine and very fine roots; slightly alkaline; clear smooth boundary.

Bk—16 to 35 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; few fine and very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual smooth boundary.

C—35 to 60 inches; light brownish gray (10YR 6/2) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable; thin lenses of sand and sandy loam; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 45 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam, fine sandy loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—sandy loam, loamy sand, loamy fine sand, fine sandy loam, or loamy very fine sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, loamy very fine sand, very fine sandy loam, or fine sandy loam

Embden Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 0 to 6 percent

Typical Pedon

Embden fine sandy loam, in an area of Egeland-Embden complex, 0 to 2 percent slopes, 2,340 feet west and 2,420 feet south of the northeast corner of

sec. 34, T. 111 N., R. 56 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak medium and fine granular structure; slightly hard, friable; common fine and very fine roots; slightly acid; clear smooth boundary.

A—6 to 17 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; common very fine roots; neutral; clear wavy boundary.

Bw1—17 to 29 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure; soft, friable; common very fine roots; neutral; clear wavy boundary.

Bw2—29 to 36 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; soft, friable; few very fine roots; neutral; clear wavy boundary.

Bk—36 to 52 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable; few very fine roots; common fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

C—52 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 40 inches
Depth to carbonates: 20 to 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over finer or coarser textured material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—fine sandy loam, sandy loam, very fine sandy loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—fine sandy loam, loam, sandy loam, or very fine sandy loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 8 (3 to 6 moist)
Chroma—1 to 4
Texture—fine sandy loam, sandy loam, loamy fine sand, very fine sandy loam, or loamy sand

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—fine sandy loam, sandy loam, loamy fine sand, or very fine sandy loam

Ethan Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 2 to 20 percent

Typical Pedon

Ethan loam, in an area of Ethan-Clarno loams, 6 to 9 percent slopes, 190 feet south and 1,220 feet east of the northwest corner of sec. 12, T. 109 N., R. 56 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable; common very fine and fine roots; about 4 percent pebbles; strong effervescence (10 percent calcium carbonate); slightly alkaline; abrupt smooth boundary.

Bk1—8 to 16 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, friable; common very fine and fine roots; common very fine and fine tubular pores; common fine and medium accumulations of carbonate (20 percent calcium carbonate); about 4 percent pebbles; violent effervescence (20 percent calcium carbonate); slightly alkaline; clear wavy boundary.

Bk2—16 to 24 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; common fine prominent light gray (N 7/0) and reddish yellow (7.5YR 6/6) mottles; weak medium subangular blocky structure parting to weak coarse subangular blocky; hard, friable; common very fine and fine roots; common very fine and fine tubular pores; common fine and medium accumulations of carbonate; about 4 percent pebbles; violent effervescence (21 percent calcium carbonate); slightly alkaline; gradual wavy boundary.

C1—24 to 40 inches; light yellowish brown (2.5Y 6/4)

clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent light gray (N 7/0) and reddish yellow (7.5YR 6/6) and common fine strong brown (7.5YR 5/8) mottles; hard, firm, sticky and plastic; few fine accumulations of carbonate; about 4 percent pebbles; strong effervescence (10 percent calcium carbonate); slightly alkaline; gradual wavy boundary.

C2—40 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common medium and coarse prominent light gray (N 7/0) and reddish yellow (7.5YR 6/6) and common fine strong brown (7.5YR 5/8) mottles; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; about 4 percent pebbles; strong effervescence (9 percent calcium carbonate); slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 5 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—2 or 3
Texture—loam, clay loam, silt loam, gravelly loam, loamy fine sand, or sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam, clay loam, silt loam, or fine sandy loam

Fordville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Fordville loam (fig. 13), in an area of Renshaw-Fordville loams, 0 to 2 percent slopes, 1,810 feet south and 920 feet west of the northeast corner of sec. 36, T. 112 N., R. 57 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine and very fine roots; few very fine tubular pores; about 2 percent pebbles; slightly acid; gradual wavy boundary.

Bw1—8 to 21 inches; dark brown (10YR 3/3) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; common fine and very fine roots; common very fine tubular pores; about 2 percent pebbles; slightly acid; gradual wavy boundary.

Bw2—21 to 29 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; common fine and very fine roots; few very fine tubular pores; about 2 percent pebbles; slightly acid; clear wavy boundary.

2C1—29 to 36 inches; multicolored gravelly loamy sand; single grain; loose; few fine and very fine roots; strong effervescence; few shale fragments; about 20 percent gravel; slightly alkaline; gradual wavy boundary.

2C2—36 to 60 inches; multicolored gravelly sand; single grain; loose; few fine and very fine roots; 20 percent gravel; strong effervescence; few shale fragments; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 17 to 40 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4

Texture—loam, silt loam, or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—sand, gravelly loamy sand, gravelly sand, loamy sand, gravelly coarse sand, very gravelly sand, or very gravelly loamy sand

Henkin Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 2 to 6 percent

Typical Pedon

Henkin fine sandy loam, in an area of Henkin-Blendon fine sandy loams, 2 to 6 percent slopes, 1,910 feet south and 2,350 feet west of the northeast corner of sec. 5, T. 110 N., R. 57 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; common fine and very fine roots; slightly acid; clear smooth boundary.

Bw1—8 to 17 inches; brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; soft, very friable; common fine and very fine roots; neutral; clear smooth boundary.

Bw2—17 to 26 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; soft, very friable; few fine and very fine roots; neutral; clear smooth boundary.

Bk—26 to 44 inches; light yellowish brown (2.5Y 6/3) sandy loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; soft, very friable; few fine and very fine roots; few medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C—44 to 60 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; massive; soft, very friable; few fine and very fine roots; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till or gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam, loam, or sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—fine sandy loam, sandy loam, loam, loamy fine sand, or loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—fine sand, loamy fine sand, fine sandy loam, or clay loam

Hetland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Ice-walled lake plains
Parent material: Clayey glaciolacustrine sediments
Slope: 0 to 6 percent

Typical Pedon

Hetland silty clay loam (fig. 14), 0 to 2 percent slopes, 95 feet west and 2,510 feet south of the northeast corner of sec. 36, T. 112 N., R. 55 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, firm, sticky and plastic; common very fine roots; slightly acid; abrupt smooth boundary.

Bt—8 to 23 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, very firm, sticky and plastic; few very fine roots; common very fine tubular pores; common shiny films on faces of peds; common dark gray (10YR 4/1) tongues 1/4 to 3/8 inch wide; neutral; clear wavy boundary.

Bk—23 to 41 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent brownish yellow (10YR 6/8) and common fine distinct light gray (2.5Y 7/2) mottles; weak coarse prismatic structure parting to weak medium and fine subangular blocky; hard, firm, sticky and plastic; few very fine roots; few dark gray (10YR 4/1) fingers and tongues ¼ to ⅜ inch wide; few fine dark accumulations of iron and manganese oxide; common fine and medium accumulations of carbonate; strong effervescence; slightly alkaline; gradual smooth boundary.

C—41 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine to coarse prominent brownish yellow (10YR 6/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 26 inches
Depth to carbonates: 16 to 32 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silty clay

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—silty clay or silty clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Holmquist Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Holmquist loam, in an area of La Prairie-Holmquist loams, channeled, 850 feet west and 1,160 feet north of the southeast corner of sec. 2, T. 111 N., R. 53 W.

A—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable; common fine and very fine roots; very few fine accumulations of salt; strong effervescence; slightly alkaline; abrupt wavy boundary.

Az—4 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, black (10YR 2/1) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine accumulations of salt; strong effervescence; slightly alkaline; abrupt wavy boundary.

A/C—8 to 14 inches; very dark grayish brown (10YR 3/2) clay loam interbedded with grayish brown (10YR 5/2) silty clay loam, black (10YR 2/1) and dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strong effervescence; slightly alkaline; clear wavy boundary.

C1—14 to 26 inches; gray (10YR 6/1) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

C2—26 to 40 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine prominent yellowish brown (10YR 5/8) mottles; massive; soft, friable; few very fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

C3—40 to 48 inches; gray (10YR 6/1) loamy sand, dark grayish brown (10YR 4/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles; single grain; loose; few fine accumulations of carbonate; 1 percent pebbles; strong effervescence; slightly alkaline; clear wavy boundary.

C4—48 to 60 inches; gray (10YR 6/1) clay loam, dark grayish brown (10YR 4/2) moist; common fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate;

1 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 0 to 11 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, fine sandy loam, or sandy loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 7 (2.5 to 5 moist)
Chroma—1 to 4
Texture—stratified loamy sand to clay loam

Houdek Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Houdek loam (fig. 15), in an area of Houdek-Stickney complex, 0 to 2 percent slopes, 90 feet south and 2,595 west of the northeast corner of sec. 4, T. 112 N.; R. 58 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; many very fine roots; about 1 percent pebbles; slightly acid; abrupt wavy boundary.

Bt1—8 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; many distinct dark grayish brown (10YR 4/2) discontinuous shiny films on vertical faces of peds; about 1 percent pebbles; neutral; gradual smooth boundary.

Bt2—14 to 18 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; shiny films on faces of peds; neutral; clear wavy boundary.

Bk—18 to 38 inches; light brownish gray (10YR 6/3) loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular pores; many fine and medium accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—38 to 48 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; few fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; very hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine accumulations of carbonate; about 2 percent pebbles; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—48 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; very hard, friable, slightly sticky and slightly plastic; about 2 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 14 to 24 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches
Other features: The mottles are relict.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4
Texture—loam or clay loam

Hoven Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Very slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Hoven silt loam, 820 feet south and 765 feet east of the northwest corner of sec. 18, T. 111 N., R. 58 W.

E—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; common fine distinct yellowish brown (10YR 5/4) mottles; weak thin and medium platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear wavy boundary.

Btn1—2 to 5 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; coatings of gray (10YR 5/1) silt loam on sides and tops of columns; common fine distinct yellowish brown (10YR 5/4) mottles: moderate medium and coarse columnar structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few fine and very fine roots; few shiny films on faces of peds; few medium concretions of iron and manganese oxide; neutral; clear wavy boundary.

Btn2—5 to 17 inches; very dark gray (10YR 4/1) silty clay, black (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; few shiny films on faces of peds; slightly alkaline; gradual wavy boundary.

Btnz—17 to 32 inches; very dark gray (10YR 4/1) silty clay, black (10YR 3/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; few shiny films on faces of peds; common fine and medium nests of gypsum and other salts; moderately alkaline; clear wavy boundary.

Bkz—32 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; few fine accumulations of carbonate; common fine and medium nests of gypsum and other salts; strong effervescence; moderately alkaline; diffuse wavy boundary.

C—40 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct light gray (N 7/0) and prominent yellow (10YR 7/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; few fine nests of gypsum and other salts; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 52 inches
Depth to carbonates: 7 to 32 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 15 to 60 inches

E horizon:
Hue—10YR
Value—5 to 7 (2 to 4 moist)
Chroma—1 or 2
Texture—silt loam or silty clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—clay, silty clay, clay loam, or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 or 4 moist)
Chroma—1 or 2
Texture—silty clay loam, clay loam, or silty clay

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 3
Texture—clay, silty clay, clay loam, or silty clay loam

Jerauld Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Very slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Jerauld silt loam, in an area of Dudley-Jerauld silt loams, 165 feet south and 100 feet west of the

northeast corner of sec. 5, T. 112 N., R. 58 W.

E—0 to 2 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common fine and very fine roots; about 1 percent pebbles; slightly acid; abrupt wavy boundary.

Btn1—2 to 4 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; coatings of grayish brown (10YR 5/2) silt loam on tops of columns; moderate medium columnar structure; very hard, very firm, slightly sticky and slightly plastic; few fine and very fine roots; common discontinuous shiny films on vertical faces of peds; about 2 percent pebbles; neutral; clear wavy boundary.

Btn2—4 to 14 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; very hard, very firm, slightly sticky and slightly plastic; few fine and very fine roots; common discontinuous shiny films on vertical faces of peds; about 2 percent pebbles; neutral; gradual wavy boundary.

Bkz—14 to 30 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; common fine accumulations of carbonate; common fine accumulations of salts; about 3 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—30 to 50 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few fine accumulations of iron and manganese oxide; common fine accumulations of carbonate; few fine accumulations of salts; about 3 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—50 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive gray (2.5Y 4/2) moist; common fine prominent strong brown (7.5YR 5/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; common fine accumulations of iron and manganese oxide; common fine accumulations of carbonate; about 3 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 27 inches
Depth to carbonates: 6 to 17 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 1 to 16 inches
Other features: Some pedons have an A horizon.

E horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silt loam, silty clay loam, loam, or silty clay

Btn horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—clay loam, clay, or silty clay

Bkz horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—1 to 3
Texture—silty clay, clay, or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam, clay loam, silty clay, or clay

Lamoure Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Lamoure silty clay loam, 190 feet east and 205 feet north of the southwest corner of sec. 28, T. 112 N., R. 53 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few salt crusts on surface; strong effervescence; slightly alkaline; abrupt smooth boundary.

A1—7 to 11 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak coarse and medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

A2—11 to 18 inches; very dark gray (10YR 3/1) silty

Figure 12.—A profile of Badger silty clay loam. This poorly drained soil formed in local clayey alluvium on toe slopes. Depth is marked in feet.

Figure 13.—A profile of Fordville loam. Gravelly loamy sand is at a depth of about 28 inches. Depth is marked in feet.

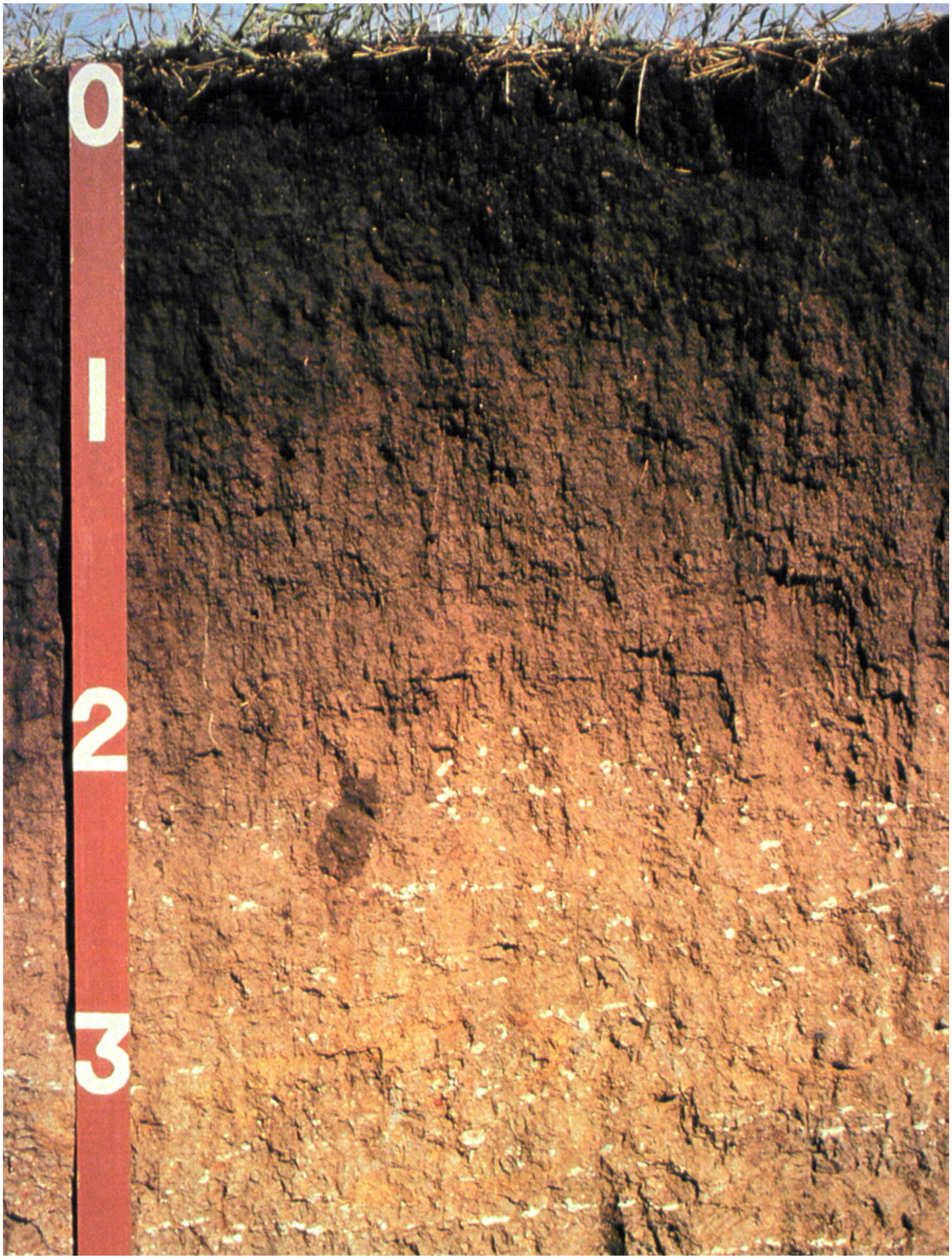

Figure 14.—A profile of Hetland silty clay loam. This soil formed in clayey glaciolacustrine sediments. Depth is marked in feet.

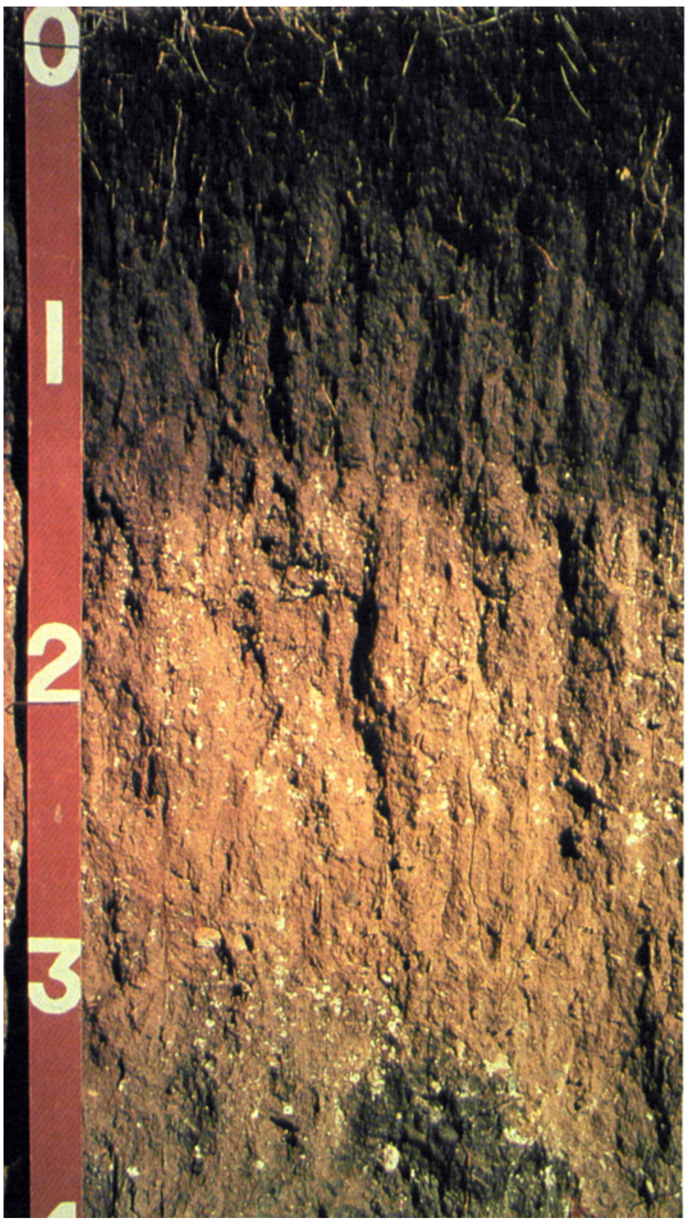

Figure 15.—A profile of Houdek loam. Calcium carbonate is at a depth of about 18 inches. Depth is marked in feet.

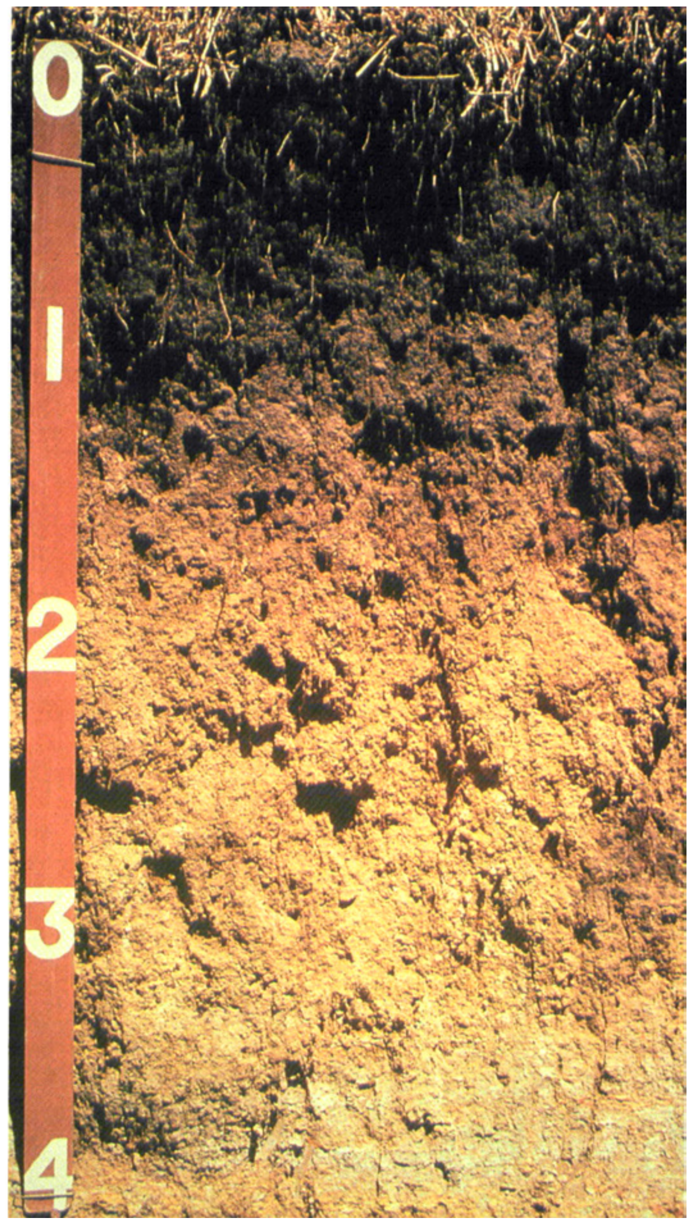

Figure 16.—A profile of Poinsett silty clay loam. Calcium carbonate is at a depth of about 24 inches. Depth is marked in feet.

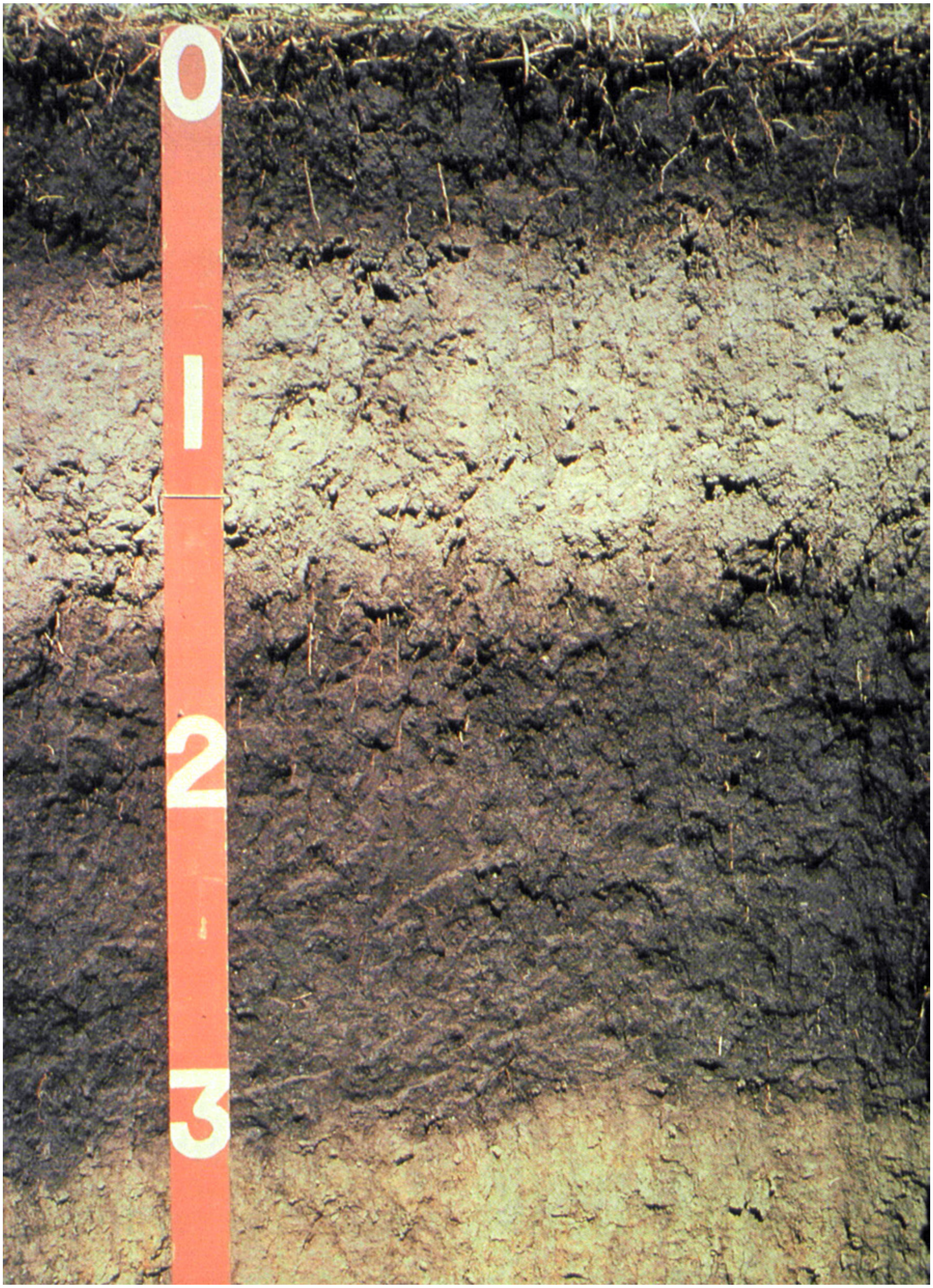

Figure 17.—A profile of Tetonka silt loam. This soil is poorly drained. Depth is marked in feet.

clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

A3—18 to 25 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cg1—25 to 40 inches; light gray (5Y 6/1) silty clay loam, dark gray (5Y 4/1) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine dark accumulations of iron and manganese oxide; common fine and medium accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

Cg2—40 to 48 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very hard, friable, slightly sticky and slightly plastic; few fine dark accumulations of iron and manganese oxide; common fine and medium accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

Cg3—48 to 60 inches; gray (5Y 5/1) silty clay loam, very dark gray (5Y 3/1) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few fine dark accumulations of iron and manganese oxide; common fine to coarse accumulations of carbonate; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over sandy or gravelly material

Depth to gypsum and other salts: Greater than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Cg horizon:

Hue—2.5Y, 5Y, or neutral
Value—4 to 8 (2 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam; stratified loam, silt loam, sandy loam, silty clay loam, or clay in the lower part

La Prairie Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

La Prairie loam, in an area of La Prairie-Holmquist loams, channeled, 800 feet north and 2,575 feet west of the southeast corner of sec. 23, T. 111 N., R. 56 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine roots; neutral; clear smooth boundary.

A—5 to 14 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; common very fine roots; neutral; clear smooth boundary.

Bk—14 to 26 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure; hard, friable; few very fine roots; common fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

C1—26 to 32 inches; gray (10YR 5/1) loam, dark gray (10YR 4/1) moist; massive; slightly hard, friable; few very fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

C2—32 to 42 inches; grayish brown (10YR 5/2) clay loam, dark gray (10YR 4/1) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine accumulations of carbonate; slight effervescence; slightly alkaline; clear wavy boundary.

C3—42 to 53 inches; light brownish gray (10YR 6/2) sand, grayish brown (10YR 5/2) moist; single grain; loose; slight effervescence; neutral; clear wavy boundary.

C4—53 to 60 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; few fine prominent reddish yellow (7.5YR 6/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 50 inches
Depth to carbonates: 0 to 40 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over clayey or sandy material
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a Bw horizon.

A horizon:
Hue—10YR or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, silt loam, clay loam, or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam, clay loam, silt loam, or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—loam, clay loam, silt loam, or silty clay loam; strata of very coarse sand to clay below a depth of 40 inches

Lowe Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 1 percent

Typical Pedon

Lowe loam, 90 feet east and 1,680 feet north of the southwest corner of sec. 25, T. 111 N., R. 56 W.

A1—0 to 4 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; slight effervescence (12 percent calcium carbonate); slightly alkaline; abrupt wavy boundary.

A2—4 to 12 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine accumulations of carbonate; slight effervescence (13 percent calcium carbonate); slightly alkaline; clear wavy boundary.

Bk—12 to 23 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many fine and medium accumulations of carbonate; strong effervescence (25 percent calcium carbonate); moderately alkaline; clear wavy boundary.

Ab—23 to 35 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; slight effervescence (12 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

Bkb—35 to 50 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and medium accumulations of carbonate; strong effervescence (19 percent calcium carbonate); moderately alkaline; clear wavy boundary.

Cg—50 to 60 inches; dark gray (5Y 4/1) silty clay loam, very dark gray (5Y 3/1) moist; few fine prominent brownish yellow (10YR 6/8) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few medium accumulations of gypsum; strong effervescence (14 percent calcium carbonate); moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material
Depth to gypsum and other salts: 29 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, clay loam, silt loam, or silty clay loam

Bk horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—loam, clay loam, or silt loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)

Chroma—1 to 3
Texture—stratified silty clay loam to loamy sand

Maddock Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Moraines
Parent material: Sandy glaciofluvial sediments
Slope: 6 to 9 percent

Typical Pedon

Maddock sandy loam, in an area of Egeland-Maddock sandy loams, 6 to 9 percent slopes, 100 feet east and 890 feet north of the southwest corner of sec. 24, T. 109 N., R. 55 W.

A—0 to 9 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, friable; common fine and very fine roots; neutral; abrupt smooth boundary.

Bw—9 to 14 inches; brown (10YR 4/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; few fine and very fine roots; neutral; clear wavy boundary.

C1—14 to 28 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; single grain; soft, very friable; few fine and very fine roots; slightly alkaline; gradual wavy boundary.

C2—28 to 34 inches; yellowish brown (10YR 5/4) loamy fine sand, brown (10YR 4/3) moist; single grain; loose; slightly alkaline; clear wavy boundary.

C3—34 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; single grain; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons do not have a Cg horizon.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loamy fine sand, loam, fine sand, or loamy sand

Bw horizon:
Hue—10YR
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—fine sand, loamy fine sand, or loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—fine sand, loamy fine sand, loamy sand, or sand

Marysland Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Marysland loam, 670 feet west and 1,280 feet north of the southeast corner of sec. 22, T. 111 N., R. 56 W.

A—0 to 12 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine and medium granular; slightly hard, friable; common fine and very fine roots; few fine accumulations of carbonate; strong effervescence (14 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

Bkg1—12 to 21 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; common fine accumulations of carbonate; violent effervescence (26 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

Bkg2—21 to 30 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; common fine accumulations of carbonate; violent effervescence (21 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

Cg1—30 to 36 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; few fine prominent strong brown (7.5YR 5/8) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine

accumulations of carbonate; strong effervescence (13 percent calcium carbonate); about 3 percent pebbles; moderately alkaline; gradual wavy boundary.

2Cg2—36 to 45 inches; light gray (5Y 7/2) gravelly loamy sand, olive (5Y 5/3) moist; few fine prominent strong brown (7.5YR 5/8) mottles; single grain; loose; about 20 percent gravel; strong effervescence (13 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

2Cg3—45 to 51 inches; light gray (5Y 7/2) gravelly loamy sand, pale olive (5Y 6/4) moist; common fine prominent strong brown (7.5YR 5/8) mottles; single grain; loose; about 25 percent gravel; strong effervescence (12 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

2Cg4—51 to 60 inches; olive gray (5Y 5/2) loamy sand, dark olive gray (5Y 3/2) moist; few fine prominent strong brown (7.5YR 5/8) mottles; single grain; loose; about 4 percent pebbles; strong effervescence (11 percent calcium carbonate); moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons do not have a Cg horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, silt loam, sandy clay loam, or clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—loam, clay loam, sandy clay loam, fine sandy loam, or sandy loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—fine sand, sand, loamy sand, gravelly loamy sand, coarse sand, loamy coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Minnewasta Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid in the sandy sediments and slow in the underlying glacial till
Landform: Beach terraces
Parent material: Sandy lacustrine sediments over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Minnewasta sandy loam, 0 to 2 percent slopes, 925 feet south and 2,050 feet east of the northwest corner of sec. 15, T. 109 N., R. 55 W.

A—0 to 5 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; common very fine roots; moderately alkaline; clear smooth boundary.

C1—5 to 13 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/8) mottles; single grain; loose; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

2C2—13 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish brown (10YR 5/8) and many fine and medium distinct light gray (10YR 6/1) mottles; massive; hard, firm, slightly sticky and slightly plastic; about 2 percent pebbles; strong effervescence; strongly alkaline; gradual wavy boundary.

2C3—29 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine and medium prominent yellowish brown (10YR 5/8) and many fine and medium distinct light gray (10YR 6/1) mottles; massive; very hard, firm, sticky and plastic; few fine irregular accumulations of iron and manganese oxide; about 2 percent pebbles; strong effervescence; strongly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches
Depth to contrasting or impervious layer: 10 to 20 inches over glacial till
Depth to gypsum and other salts: 16 to more than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam, loam, fine sandy loam, loamy sand, or gravelly sand

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, or gravelly sand

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—sandy clay loam or clay loam

Minnewaukan Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Beach terraces
Parent material: Sandy lacustrine sediments
Slope: 0 to 3 percent

Typical Pedon

Minnewaukan loamy sand, 1,550 feet east and 1,680 feet south of the northwest corner of sec. 20, T. 110 N., R. 55 W.

A—0 to 6 inches; dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; weak fine granular structure; soft, friable; common fine and very fine roots; slight effervescence; slightly alkaline; abrupt wavy boundary.

C1—6 to 11 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; common fine and very fine roots; slight effervescence; slightly alkaline; abrupt wavy boundary.

C2—11 to 19 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; common fine and very fine roots; slight effervescence; slightly alkaline; clear wavy boundary.

C3—19 to 28 inches; grayish brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine roots; slight effervescence; slightly alkaline; gradual wavy boundary.

C4—28 to 40 inches; light brownish gray (2.5Y 6/2) sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few very fine roots; slight effervescence; slightly alkaline; gradual wavy boundary.

C5—40 to 60 inches; light yellowish brown (2.5Y 6/4) gravelly coarse sand, olive brown (2.5Y 4/4) moist; single grain; loose; about 20 percent pebbles; slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material
Depth to gypsum and other salts: 30 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—loamy sand, loamy fine sand, loamy coarse sand, fine sandy loam, sandy loam, or sand

C horizon:
Hue—10YR, 2.5Y, 5Y, or 5GY
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—loamy sand, fine sand, sand, or gravelly coarse sand

Oldham Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Oldham silty clay loam, 1,300 feet west and 96 feet south of the northeast corner of sec. 23, T. 109 N., R. 53 W.

Ap—0 to 8 inches; very dark gray (N 3/0) silty clay loam, black (N 2/0) moist; weak medium and fine subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; few fine accumulations of carbonate; slight effervescence; slightly alkaline; abrupt smooth boundary.

Bg—8 to 15 inches; very dark gray (N 3/0) silty clay, black (N 2/0) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; very hard, very firm, sticky and plastic; few very fine roots; few fine accumulations of carbonate; slight effervescence; slightly alkaline; gradual wavy boundary.

Bkg—15 to 24 inches; dark gray (N 4/0) silty clay, black (N 2/0) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; common medium and coarse accumulations of carbonate; slight effervescence; slightly alkaline; gradual wavy boundary.

Bkzg—24 to 38 inches; dark grayish brown (2.5Y 4/2)

silty clay, very dark gray (N 3/0) and dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish red (5YR 5/6) mottles; weak medium and fine subangular blocky structure; very hard, very firm, sticky and plastic; common fine and medium accumulations of carbonate; many fine accumulations of salts; strong effervescence; slightly alkaline; gradual smooth boundary.

Cg—38 to 60 inches; light gray (5Y 7/1) silty clay loam, olive gray (5Y 5/2) moist; wedges and filled root channels of very dark gray (N 3/0 moist) material; few fine prominent yellowish red (5YR 5/6) mottles; massive; very hard, very firm, sticky and plastic; few fine and medium accumulations of carbonate; violent effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: 20 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bkg, Bkzg, or Bkyg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—silty clay loam or silty clay

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, or silty clay

Parnell Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Parnell silty clay loam, 122 feet east and 1,300 feet north of the southwest corner of sec. 15, T. 110 N., R. 53 W.

A—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; organic mulch about 1 inch thick on the surface; slightly acid; clear wavy boundary.

Btg1—10 to 17 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common fine roots; few patchy shiny films on faces of peds; neutral; clear wavy boundary.

Btg2—17 to 29 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, very firm, sticky and plastic; common fine roots; continuous shiny films on faces of peds; neutral; gradual wavy boundary.

Btg3—29 to 48 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; common fine prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, very firm, very sticky and very plastic; few fine roots; few tongues of very dark gray (10YR 3/1) material; neutral; clear wavy boundary.

Cg—48 to 60 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; common fine prominent olive yellow (2.5Y 6/6) mottles; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Depth to carbonates: 35 to more than 60 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, loam, or silty clay

Btg horizon:
Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay loam, or clay

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay, clay loam, silty clay loam, clay, or loam

Playmoor Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Playmoor silty clay loam, 120 feet east and 1,400 feet north of the southwest corner of sec. 29, T. 109 N., R. 54 W.

Az—0 to 6 inches; very dark gray (5Y 3/1) silty clay loam, black (5Y 2/1) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine accumulations of salts; slight effervescence; moderately alkaline; gradual smooth boundary.

Bzg—6 to 15 inches; very dark gray (5Y 3/1) silty clay loam, black (5Y 2/1) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; many fine accumulations of salts; slight effervescence; moderately alkaline; clear smooth boundary.

Bkzg1—15 to 24 inches; dark gray (5Y 4/1) silty clay loam, very dark gray (5Y 3/1) moist; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine accumulations of carbonate; many coarse accumulations of salts; strong effervescence; moderately alkaline; gradual smooth boundary.

Bkzg2—24 to 33 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine accumulations of carbonate; many coarse accumulations of salts; strong effervescence; moderately alkaline; clear smooth boundary.

Cg—33 to 60 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine accumulations of carbonate; few fine accumulations of salts; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Carbonates: At the surface
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till or gravelly material
Depth to gypsum and other salts: 0 to 7 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Bz horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 4 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Bkg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 7 (2 to 6 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or neutral
Value—5 to 7 (3 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam

Poinsett Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Silty glacial till
Slope: 0 to 9 percent

Typical Pedon

Poinsett silty clay loam (fig. 16), in an area of Poinsett-Waubay silty clay loams, 1 to 6 percent slopes, 800 feet north and 275 feet west of the southeast corner of sec. 13, T. 111 N., R. 54 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine

granular; slightly hard, friable; common fine and very fine roots; few very fine tubular pores; slightly acid; abrupt smooth boundary.

Bw1—10 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; common fine and very fine roots; few very fine tubular pores; neutral; gradual wavy boundary.

Bw2—15 to 24 inches; light olive brown (2.5Y 5/4) silt loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; common fine and very fine roots; common very fine and fine tubular pores; slightly alkaline; gradual wavy boundary.

Bk1—24 to 38 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine and very fine roots; common very fine tubular pores; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Bk2—38 to 44 inches; light brownish gray (2.5Y 6/2) silt loam, olive brown (2.5Y 4/4) moist; few fine prominent strong brown (7.5YR 5.8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine and very fine roots; few very fine tubular pores; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—44 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine prominent strong brown (7.5YR 5/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; about 2 percent pebbles; strong effervescence; moderately alkaline; gradual smooth boundary.

2C2—48 to 53 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; common fine and medium prominent strong brown (7.5YR 5/8) mottles; massive; hard, friable, sticky and plastic; common fine and medium accumulations of carbonate; few fine dark accumulations of iron and manganese oxide; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

2C3—53 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; common coarse prominent light gray (10YR 7/1) and common medium prominent strong brown (7.5YR 5/8) mottles; massive; hard, friable, sticky and plastic; few fine dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: The mottles are relict. Some pedons do not have a 2C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam, silt loam, or clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—6 or 7 (5 or 6 moist)
Chroma—1 to 4
Texture—silt loam or silty clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—6 or 7 (5 or 6 moist)
Chroma—1 to 4
Texture—clay loam

Prosper Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Prosper loam, in an area of Houdek-Prosper loams, 0 to 2 percent slopes, 400 feet east and 2,000 feet south of

the northwest corner of sec. 30, T. 109 N., R. 58 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable; common very fine roots; about 1 percent pebbles; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable; many very fine roots; few fine tubular pores; about 1 percent pebbles; neutral; clear wavy boundary.

Bt—13 to 23 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; shiny films on faces of peds; about 2 percent pebbles; neutral; abrupt wavy boundary.

Bk—23 to 38 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common medium and fine accumulations of carbonate; about 2 percent pebbles; strong effervescence; slightly alkaline; gradual wavy boundary.

C—38 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; common fine prominent strong brown (7.5YR 5/8), light gray (N 7/0), and brownish yellow (10YR 6/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; few fine accumulations of carbonate; about 2 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 30 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—clay loam or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Renshaw Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 9 percent

Typical Pedon

Renshaw loam, in an area of Renshaw-Sioux complex, 2 to 6 percent slopes, 70 feet east and 700 feet north of the southwest corner of sec. 32, T. 112 N., R. 56 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, friable; common very fine roots; about 1 percent pebbles; neutral; abrupt smooth boundary.

Bw1—8 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate coarse and medium subangular blocky; soft, friable; common very fine roots; few very fine tubular pores; about 3 percent pebbles; neutral; abrupt wavy boundary.

Bw2—16 to 18 inches; brown (10YR 5/3) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate coarse and medium subangular blocky structure; soft, friable; common very fine roots; about 20 percent gravel; neutral; abrupt wavy boundary.

2C—18 to 60 inches; multicolored very gravelly loamy sand; single grain; loose; about 35 percent gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 16 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting or impervious layer: 14 to 20 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—loam, gravelly loam, or sandy loam

Bw horizon:
Hue—10YR
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 4
Texture—loam, sandy loam, sandy clay loam, or gravelly loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly loamy sand, very gravelly loamy sand, gravelly sand, very gravelly sand, gravelly coarse sand, very gravelly coarse sand, or coarse sand

Rusklyn Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Silty glacial till
Slope: 2 to 6 percent

Typical Pedon

Rusklyn silty clay loam, in an area of Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes, 2,587 feet north and 192 feet west of the southeast corner of sec. 29, T. 112 N., R. 56 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/1) moist; weak thick platy structure parting to weak fine granular; hard, friable; common very fine roots; few fine accumulations of carbonate; strong effervescence; neutral; abrupt smooth boundary.

Bk1—8 to 23 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common very fine roots; common very fine tubular pores; common fine and medium accumulations of carbonates; strong effervescence; slightly alkaline; gradual wavy boundary.

Bk2—23 to 34 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; many fine and medium distinct brownish yellow (10YR 6/8) mottles; massive; slightly hard, friable; few very fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

C1—34 to 50 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; many fine and medium distinct brownish yellow (10YR 6/8) mottles; massive; slightly hard, friable; few very fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—50 to 57 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; many fine distinct yellow (10YR 7/8) and many fine prominent light gray (N 7/0) mottles; massive; slightly hard, friable; strong effervescence; slightly alkaline; clear wavy boundary.

C3—57 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; many fine distinct yellow (10YR 7/8) and many fine prominent light gray (2.5Y 7/0) mottles; massive; slightly hard, friable; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 5 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a 2C horizon.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Sinai Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Very slow
Landform: Ice-walled lake plains
Parent material: Clayey glaciolacustrine sediments
Slope: 0 to 2 percent

Typical Pedon

Sinai silty clay, 0 to 2 percent slopes, 150 feet east and 500 feet north of the southwest corner of sec. 11, T. 110 N., R. 55 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; neutral; abrupt smooth boundary.

Bss—8 to 23 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to strong medium and fine subangular blocky; hard, very firm, sticky and plastic; common very fine roots; shiny films on faces of peds; common tongues ⅛ inch to 2 inches wide of dark gray (10YR 4/1) and very dark gray (10YR 3/1 moist) material; few intersecting slickensides; neutral; clear smooth boundary.

Bkss1—23 to 31 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few very fine roots; few tongues ⅛ to 1 inch wide of dark gray (10YR 4/1) and very dark gray (10YR 3/1 moist) material; few intersecting slickensides; few fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual smooth boundary.

Bkss2—31 to 38 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; many fine and medium prominent reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; few intersecting slickensides; common fine and medium accumulations of carbonate; strong effervescence; slightly alkaline; clear smooth boundary.

C1—38 to 48 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; common fine and medium prominent reddish yellow (7.5YR 6/8) mottles; massive; hard, firm, sticky and plastic; few fine and medium dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; few fine nests of salt; strong effervescence; slightly alkaline; gradual smooth boundary.

C2—48 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; many fine and medium prominent reddish yellow (7.5YR 6/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine and medium dark accumulations of iron and manganese oxide; few fine accumulations of carbonate; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 17 to 34 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay loam, or clay

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 to 3
Texture—silty clay, clay, or silty clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam or silty clay

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 6
Texture—silty clay, clay, or stratified silty clay loam, silty clay, clay loam, or silt loam

Sioux Series

Depth to bedrock: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 2 to 15 percent

Typical Pedon

Sioux gravelly loam, in an area of Renshaw-Sioux complex, 6 to 9 percent slopes, 369 feet west and 1,660 feet north of the southeast corner of sec. 10, T. 110 N., R. 56 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) gravelly loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; few fine and very fine roots; about 20 percent gravel; neutral; clear smooth boundary.

AC—8 to 13 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown

(10YR 3/2) moist; weak fine granular structure; soft, very friable; few fine and very fine roots; about 40 percent gravel; slight effervescence; slightly alkaline; clear smooth boundary.

C—13 to 60 inches; multicolored very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; few fine and very fine roots; about 40 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 8 inches
Depth to contrasting or impervious layer: 6 to 14 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1
Texture—gravelly loam, sandy loam, gravelly sandy loam, loam, loamy sand, loamy coarse sand, or gravelly loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, gravelly loamy sand, very gravelly loamy sand, very gravelly sand, extremely gravelly sand, very gravelly coarse sand, or extremely gravelly coarse sand

Southam Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Southam silty clay loam, 600 feet north and 1,100 feet west of the southeast corner of sec. 1, T. 111 N., R. 54 W.

Ag1—0 to 12 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2/1) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine to medium roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ag2—12 to 25 inches; dark gray (5Y 4/1) silty clay, black (5Y 2/1) moist; few fine to coarse prominent light yellowish brown (10YR 6/4) mottles; massive; very hard, very firm, sticky and plastic; few very fine to medium roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg—25 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent strong brown (7.5YR 5/8) mottles; massive; very hard, very firm, sticky and plastic; few very fine roots; common fine and medium dark accumulations of iron and manganese oxide; few fine to coarse accumulations of carbonate; few fine accumulations of salt; about 1 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 25 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay loam, silty clay, clay loam, silt loam, or clay

Cg horizon:
Hue—2.5Y, 5Y, 5GY, or neutral
Value—4 to 8 (3 to 7 moist)
Chroma—0 to 2
Texture—silty clay loam, clay loam, silty clay, or clay

Stickney Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Stickney silt loam, in an area of Houdek-Stickney complex, 0 to 2 percent slopes, 222 feet south and 700 feet west of the northeast corner of sec. 5, T. 112 N., R. 58 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine

granular; slightly hard, friable; many very fine and fine roots; 1 percent pebbles; slightly acid; clear wavy boundary.

E—6 to 10 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak thick platy; slightly hard, friable; common very fine and fine roots; common very fine and fine tubular pores; about 1 percent pebbles; neutral; abrupt wavy boundary.

BE—10 to 11 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; about 1 percent pebbles; neutral; abrupt wavy boundary.

Btn—11 to 20 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine roots between peds; many very fine and fine tubular pores; common discontinuous shiny films on vertical faces of peds; about 1 percent pebbles; neutral; abrupt wavy boundary.

Bk—20 to 35 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, moderately sticky and moderately plastic; common very fine roots; many very fine and fine tubular pores; common fine and medium accumulations of carbonate; about 1 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

Cz—35 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine prominent light gray (N 7/0), gray (N 6/0), and strong brown (7.5YR 5/8) mottles; massive; very hard, firm, sticky and plastic; common medium accumulations of carbonate; common fine irregular masses of salts; about 1 percent pebbles; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 49 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 20 to more than 60 inches
Other features: Some pedons have a Bz horizon.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam, loam, or silty clay loam

E horizon:
Hue—10YR
Value—5 or 6 (3 or 4 moist)
Chroma—1 to 3
Texture—silt loam, loam, or silty clay loam

BE horizon:
Hue—10YR
Value—3 to 6 (2 to 4 moist)
Chroma—1 to 3
Texture—clay loam, loam, or silty clay loam

Btn horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—clay loam, silty clay loam, silty clay, or clay

Bk or Bz horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3
Texture—clay loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Talmo Series

Depth to bedrock: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 2 to 15 percent

Typical Pedon

Talmo loam, in an area of Delmont-Talmo loams, 2 to 6 percent slopes, 2,160 feet south and 425 feet west of the northeast corner of sec. 7, T. 110 N., R. 56 W.

A—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; many very fine roots; few very fine and fine tubular pores; about 3 percent pebbles; slightly alkaline; clear smooth boundary.

2C—7 to 60 inches; grayish brown (10YR 5/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; about 65

percent gravel; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 14 inches
Depth to contrasting or impervious layer: 6 to 14 inches over gravelly material
Depth to gypsum and other salts: Greater than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, gravelly loam, gravelly sandy loam, or sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—very gravelly sand, very gravelly loamy sand, extremely gravelly loamy sand, or extremely gravelly sand

Tetonka Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Tetonka silt loam (fig. 17), 110 feet south and 1,180 feet west of the northeast corner of sec. 18, T. 111 N., R. 56 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; slightly hard, friable; common very fine roots; common very fine tubular pores; neutral; clear wavy boundary.

E—10 to 21 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; few fine prominent brownish yellow (10YR 6/6) mottles; weak thin platy structure parting to weak fine granular; slightly hard, friable; common very fine roots; common very fine and fine tubular pores; slightly acid; clear smooth boundary.

Bt1—21 to 31 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak fine and medium blocky; very hard, firm, moderately sticky and moderately plastic; common discontinuous shiny films on faces of peds; about 1 percent pebbles; neutral; clear wavy boundary.

Bt2—31 to 40 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, moderately sticky and moderately plastic; common discontinuous films on faces of peds; about 4 percent pebbles; neutral; gradual wavy boundary.

Bt3—40 to 48 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent brownish yellow (10YR 6/8) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, moderately sticky and moderately plastic; common discontinuous shiny films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 1 percent pebbles; neutral; clear wavy boundary.

Cg1—48 to 54 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 4/2) moist; many fine and medium prominent brownish yellow (10YR 6/8) and light gray (10YR 7/1) mottles; massive; very hard, firm, slightly sticky and slightly plastic; common medium irregular accumulations of iron and manganese oxide; about 1 percent pebbles; slight effervescence; slightly alkaline; clear wavy boundary.

Cg2—54 to 60 inches; pale yellow (5Y 7/3) clay loam, olive (5Y 5/3) moist; many medium prominent brownish yellow (10YR 6/8) and many fine and medium light gray (10YR 7/1) mottles; massive; very hard, firm, slightly sticky and slightly plastic; common fine irregular soft masses of iron and manganese oxide; about 1 percent pebbles; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 50 inches
Depth to carbonates: 30 to more than 60 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 50 to more than 60 inches

A horizon:
Hue—10YR
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam or silty clay loam

E horizon:
Hue—10YR
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2

Texture—silt loam, loam, or silty clay loam

Bt horizon:

Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 6 (2 to 4 moist)
Chroma—0 to 2
Texture—clay, silty clay, silty clay loam, or clay loam

Cg horizon:

Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay, silty clay loam, clay, clay loam, or stratified sandy loam or loam

Tonka Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Tonka silty clay loam, 168 feet north and 2,424 feet east of the southwest corner of sec. 28, T. 111 N., R. 53 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable; few fine and very fine roots; moderately acid; clear smooth boundary.

A—7 to 13 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse and medium subangular blocky structure; slightly hard, friable; few fine and very fine roots; few very fine tubular pores; slightly acid; clear wavy boundary.

E—13 to 19 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine faint brownish yellow (10YR 6/6) mottles; moderate thick platy structure; slightly hard, very friable; few fine and very fine roots; few very fine tubular pores; neutral; abrupt wavy boundary.

Bt1—19 to 30 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; strong medium prismatic structure parting to strong coarse subangular blocky; very hard, very firm, very sticky and very plastic; patchy coatings of E horizon material on tops and sides of peds; shiny films on faces of peds; few fine and very fine roots; neutral; clear wavy boundary.

Bt2—30 to 40 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate coarse and medium subangular blocky; very hard, very firm, very sticky and very plastic; shiny films on faces of peds; few fine and very fine roots; few fine accumulations of carbonate; slightly alkaline; gradual wavy boundary.

BCg—40 to 51 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent grayish brown (2.5Y 5/2) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate; slight effervescence; slightly alkaline; clear wavy boundary.

Cg—51 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 5/2) mottles; massive; very hard, friable; few fine accumulations of carbonate; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: 20 to more than 60 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: Greater than 60 inches

A horizon:

Hue—10YR or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, loam, or clay loam

E horizon:

Hue—10YR, 2.5Y, or neutral
Value—5 to 7 (3 to 5 moist)
Chroma—0 to 2
Texture—loam, silt loam, very fine sandy loam, or silty clay loam

Bt horizon:

Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam, silty clay loam, silty clay, or clay

Cg horizon:

Hue—10YR, 2.5Y, or 5Y
Value—3 to 7 (2 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam, clay loam, loam, silty clay, clay, silt loam, or sandy clay loam

Vienna Series

Depth to bedrock: Very deep
Drainage class: Well drained

Permeability: Moderately slow
Landform: Till plains
Parent material: Loess or silty glacial till over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Vienna silt loam, in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 160 feet south and 480 feet east of the northwest corner of sec. 32, T. 112 N., R. 54 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable; common very fine roots; few very fine tubular pores; few wormcasts; slightly acid; abrupt smooth boundary.

Bw—8 to 16 inches; brown (10YR 5/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; few wormcasts; neutral; clear smooth boundary; irregular soil mass at the lower boundary caused by nearly continuous stone line consisting of pebbles and cobbles up to about 6 inches in size.

2Bk1—16 to 24 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; common fine prominent brownish yellow (10YR 6/8) and common fine distinct light gray (10YR 7/1) mottles; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky and plastic; few very fine roots; common very fine tubular pores; common very fine accumulations of carbonate; about 3 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

2Bk2—24 to 32 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; common fine prominent brownish yellow (10YR 6/8) and common fine and medium distinct light gray (10YR 7/1) mottles; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; common fine and few medium accumulations of carbonate; about 3 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

2C—32 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; common fine prominent brownish yellow (10YR 6/8) and common fine and medium distinct light gray (10YR 7/1) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting or impervious layer: 10 to 20 inches over loamy glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: The mottles are relict. Some pedons have a 2Bw horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam, silty clay loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, clay loam, or loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—loam or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Waubay Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Silty glacial till
Slope: 0 to 6 percent

Typical Pedon

Waubay silty clay loam, in an area of Poinsett-Waubay silty clay loams, 1 to 6 percent slopes, 98 feet north and 1,980 feet west of the southeast corner of sec. 7, T. 110 N., R. 53 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; few very fine roots; slightly acid; abrupt smooth boundary.

A—7 to 14 inches; very dark gray (10YR 3/1) silty clay

loam, black (10YR 2/1) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; neutral; clear wavy boundary.

Bw—14 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; neutral; clear wavy boundary.

Bk1—25 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine tubular pores; common fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

Bk2—35 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine tubular pores; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

2C1—42 to 51 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish brown (10YR 5/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; about 3 percent pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

2C2—51 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish brown (10YR 5/8) mottles; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; about 3 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 35 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: Greater than 60 inches
Other features: Some pedons have a C horizon instead of a 2C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 3
Texture—silt loam or silty clay loam

Bk horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Worthing Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Worthing silty clay loam, 900 feet east and 145 feet north of the southwest corner of sec. 19, T. 109 N., R. 55 W.

A—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and fine tubular pores; few prominent grayish brown (10YR 5/2) patchy organic coatings on faces of peds; neutral; about 1 percent pebbles; clear wavy boundary.

Bt1—10 to 17 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few prominent light olive brown (2.5Y 5/6) patchy organic coatings on faces of peds; common shiny films on faces of peds; common medium and coarse rounded iron-manganese concretions; about 1 percent pebbles; neutral; gradual wavy boundary.

Bt2—17 to 32 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine and medium

subangular blocky; very hard, firm, sticky and plastic; common very fine roots; common shiny films on faces of peds; common medium and coarse rounded iron-manganese concretions; about 1 percent pebbles; neutral; gradual wavy boundary.

Bt3—32 to 45 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common shiny films on faces of peds; about 1 percent pebbles; neutral; gradual wavy boundary.

Bkg—45 to 60 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; common fine and medium prominent light gray (N 7/0) and gray (N 6/0) and common medium strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common medium accumulations of carbonate; about 1 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 35 to 60 inches
Depth to carbonates: 35 to 60 inches
Depth to contrasting or impervious layer: Greater than 60 inches
Depth to gypsum and other salts: 35 to more than 60 inches
Other features: Some pedons have a Cg horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, or silty clay

Bt horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 5 moist)
Chroma—0 or 1
Texture—silty clay or clay

Bkg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—silty clay, clay, silty clay loam, or clay loam

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Kingsbury County.

Climate

Climate directly influences the rate of chemical and physical weathering. Kingsbury County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. It also favors a moderately slow rate of weathering or soil formation. The climate in the eastern part of the county is somewhat wetter than that in the western part, and thus it has been a factor in differentiating some of the soils within the county. Detailed information about the climate of the survey area is given under the heading "General Nature of the County."

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Kingsbury County the prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many of the soils has a moderate or high content of organic matter. Bonilla and Waubay soils are examples. Betts soils have a lower content of organic matter than the Bonilla and Waubay soils because they have a less extensive grass cover and high erosion rates.

Earthworms, insects, and burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients for other plants.

Parent Material

Parent material is the unconsolidated organic and mineral material in which a soil forms. It determines many of the chemical and physical characteristics of the soil, such as color, texture, reaction, and consistence. The rate of soil formation is more rapid in the more friable, loamy and silty parent material than in other kinds of parent material. Also, the changes that take place in the parent material are more extensive and the horizons that form are more distinct.

Most of the soils in Kingsbury County formed in glacial material derived from preglacial formations of granite, gneiss, limestone, sandstone, and shale. The glacier ground up and mixed these materials as it transported them. It then deposited them as it melted. Some deposits consist of material sorted either by water as the material was deposited or by wind and water after the material was deposited. Other deposits consist of unsorted material or glacial till.

Glacial till is a heterogeneous mixture of clay, silt, sand, and gravel that also contains few to many cobbles and boulders. It occurs throughout most of

Kingsbury County. The western part of the county is predominantly loamy glacial till. Loamy glacial till also occurs in scattered areas in the eastern part of the county. Soils that formed in loamy glacial till include Barnes, Betts, Buse, Ethan, and Houdek soils.

Silty glacial till is material that was deposited on glacial ice and then reworked by wind and water. It generally contains fewer stones and boulders than loamy glacial till. It mantles most of eastern Kingsbury County. Among the soils that formed mostly in silty glacial till are Cubden and Poinsett soils.

Glacial outwash is sandy, gravelly, and loamy material deposited by glacial meltwater. A band of outwash sediments about 1 to 4 miles wide runs diagonally from northwest to southeast through the central portion of Kingsbury County. Narrow deposits of glacial outwash occur in small areas and adjacent to some drainageways in other parts of the county. Delmont, Fordville, Renshaw, Sioux, and Talmo soils formed in loamy material underlain by outwash sand and gravel. Egeland and Embden soils formed in sandy outwash sediments.

Glaciolacustrine deposits occur in scattered areas of eastern Kingsbury County. Hetland and Sinai soils formed in this type of material.

Alluvium is material deposited by water. Badger, Bonilla, Crossplain, Oldham, Parnell, Prosper, Tetonka, Tonka, and Waubay soils formed partly or entirely in local alluvium washed in from adjacent slopes. Baltic, Bon, Lamoure, and La Prairie soils formed in alluvium deposited by streams.

Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Betts soils, much of the rainfall is lost through runoff. As a result of excessive runoff, a limited amount of moisture penetrates the surface and much of the soil material is lost through erosion. These soils have a thin surface layer and a low content of organic matter. Runoff is slower on Houdek, Stickney, and other less sloping soils, and more moisture penetrates the surface. These soils are calcareous at a greater depth than the Buse and Ethan soils. Also, they have thicker horizons in which organic matter accumulated.

Hoven, Tetonka, and Tonka soils are in basins where water ponds. They have colors that are characteristic of poorly drained soils. Bonilla and Waubay soils, which are on foot slopes, receive extra moisture in the form of runoff from adjacent soils. The horizons in which organic matter accumulates are thicker in these soils than in the slightly higher adjacent Clarno and Poinsett soils. Soils in low areas, where drainage is impeded, are affected by a fluctuating water table that favors the concentration of salts. Playmoor soils are examples.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that form. Generally, the degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. Examples are Beadle, Dudley, and Houdek soils, which have developed distinct horizons. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Betts and Buse soils are examples of young soils that are subject to natural erosion. Holmquist soils are examples of young alluvial soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Back slopes are commonly steep and linear and descend to a foot slope. Back slopes are erosional forms produced mainly by mass wasting and running water.

Basin. A depressed area with no surface outlet. Examples are closed depressions in a glacial till plain or lake basin.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms used to describe consistence include:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Growing crops in strips that follow the contour.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes in this survey are as follows:

Very deep	more than 60 inches
Deep	40 to 60 inches
Moderately deep	20 to 40 inches
Shallow	less than 20 inches

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor

drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the

identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landform. Any physical, recognizable form or feature of the earth's surface having a characteristic shape and produced by natural causes.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include part of the subsoil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to adversely affect the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pasture, tame. Grazingland that has been planted primarily with introduced or domesticated native forage species and that receives periodic renovation or cultural treatment, such as tillage, fertilization, mowing, weed control, and irrigation.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. The uppermost inclined surface at the top of a hillslope; a transition zone from the back slope to the summit of an upland. It is dominantly convex in profile and erosional in origin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil

that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes in this survey are as follows:

Level	0 to 1 percent
Nearly level	0 to 2 percent
Very gently sloping or gently undulating	1 to 4 percent
Gently sloping or undulating	2 to 6 percent
Moderately sloping or gently rolling	6 to 9 percent
Strongly sloping or rolling	9 to 15 percent
Moderately steep or hilly	15 to 25 percent
Steep or very hilly	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The top or highest level of an upland feature. A high interfluve area of gentler slope that is flanked by steeper hillslopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It

includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Transitional layer. A layer of soil that grades to the next layer or includes parts of adjacent layers, commonly between the surface layer and the subsoil or the underlying material.

Underlying layer. The C horizon or R layer; that part of the soil below the subsoil, commonly the parent material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-87 at De Smet, South Dakota)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	22.5	2.4	12.5	48	-29	0	0.58	0.15	0.89	2	6.0
February----	29.8	10.0	19.9	57	-25	0	.69	.27	1.05	2	7.3
March-------	40.1	20.2	30.2	71	-11	21	1.43	.47	2.18	4	8.4
April-------	58.5	34.1	46.3	87	12	78	2.31	.95	3.35	5	1.8
May---------	71.0	45.6	58.3	91	25	276	3.08	1.35	4.47	6	.1
June--------	79.6	55.2	67.4	97	39	522	4.22	2.15	5.78	7	.0
July--------	86.3	60.7	73.5	101	45	729	3.16	1.36	4.52	5	.0
August------	84.3	58.5	71.4	100	43	663	2.79	1.16	3.84	5	.0
September---	73.9	48.3	61.1	96	29	339	2.02	.69	3.05	4	.0
October-----	61.1	36.9	49.0	84	16	93	1.71	.34	2.66	3	.5
November----	41.6	22.0	31.8	69	-6	7	.96	.23	1.48	3	5.7
December----	27.3	8.9	18.1	54	-23	0	.68	.21	1.05	2	6.3
Yearly:											
Average---	56.3	33.6	45.0	---	---	---	---	---	---	---	---
Extreme---	---	---	---	102	-30	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,728	23.63	18.20	28.18	48	36.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-87 at De Smet, South Dakota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 4	May 14	May 20
2 years in 10 later than--	Apr. 28	May 8	May 15
5 years in 10 later than--	Apr. 18	Apr. 27	May 6
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 6	Sept. 28	Sept. 19
2 years in 10 earlier than--	Oct. 11	Oct. 3	Sept. 23
5 years in 10 earlier than--	Oct. 22	Oct. 11	Oct. 1

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-87 at De Smet, South Dakota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	162	146	129
8 years in 10	170	153	135
5 years in 10	186	166	147
2 years in 10	201	180	159
1 year in 10	209	187	165

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ba	Badger silty clay loam	8,166	1.5
Bb	Baltic silty clay loam	406	0.1
BcB	Barnes-Buse loams, 2 to 6 percent slopes	4,962	0.9
BcC	Barnes-Buse loams, 6 to 9 percent slopes	3,385	0.6
BdA	Beadle loam, 0 to 2 percent slopes	178	0.1
BdB	Beadle loam, 2 to 6 percent slopes	857	0.1
BdC	Beadle loam, 6 to 9 percent slopes	77	0.1
BeA	Beadle-Dudley complex, 0 to 2 percent slopes	4,462	0.8
Bn	Bon loam	1,444	0.3
Bo	Bon loam, channeled	4,241	0.8
BrB	Brandt silty clay loam, 2 to 6 percent slopes	367	0.1
BuC	Buse-Barnes loams, 6 to 9 percent slopes	9,800	1.8
BuD	Buse-Barnes loams, 9 to 20 percent slopes	2,791	0.5
BxD	Buse-Holmquist, channeled, loams, 0 to 20 percent slopes	1,722	0.3
CbA	Clarno-Bonilla loams, 0 to 2 percent slopes	24,260	4.4
CbB	Clarno-Bonilla loams, 1 to 6 percent slopes	1,740	0.3
CeB	Clarno-Ethan-Bonilla loams, 1 to 6 percent slopes	45,004	8.1
CeC	Clarno-Ethan-Bonilla loams, 2 to 9 percent slopes	3,450	0.6
Ct	Crossplain-Tetonka complex	9,734	1.8
Cu	Cubden silty clay loam	2,152	0.4
Cv	Cubden-Badger silty clay loams	7,698	1.4
Cw	Cubden-Tonka silty clay loams	656	0.1
Dc	Davison-Crossplain complex	2,768	0.5
DeA	Delmont loam, 0 to 2 percent slopes	1,002	0.2
DtB	Delmont-Talmo loams, 2 to 6 percent slopes	1,431	0.3
Dv	Divide loam	863	0.2
Dx	Dudley-Jerauld silt loams	4,690	0.8
Dy	Durrstein silt loam	149	0.1
EgA	Egeland-Embden complex, 0 to 2 percent slopes	1,176	0.2
EgB	Egeland-Embden complex, 2 to 6 percent slopes	1,351	0.2
EmC	Egeland-Maddock sandy loams, 6 to 9 percent slopes	183	0.1
EnD	Ethan-Betts loams, 9 to 20 percent slopes	1,002	0.2
EoD	Ethan-Bon, channeled, loams, 0 to 20 percent slopes	4,551	0.8
EtC	Ethan-Clarno loams, 6 to 9 percent slopes	5,866	1.1
EtD	Ethan-Clarno loams, 9 to 15 percent slopes	1,254	0.2
HbB	Henkin-Blendon fine sandy loams, 2 to 6 percent slopes	115	0.1
HeA	Hetland silty clay loam, 0 to 2 percent slopes	16,762	3.0
HeB	Hetland silty clay loam, 2 to 6 percent slopes	4,622	0.8
HpA	Houdek-Prosper loams, 0 to 2 percent slopes	133	0.1
HpB	Houdek-Prosper loams, 1 to 6 percent slopes	1,738	0.3
HsA	Houdek-Stickney complex, 0 to 2 percent slopes	41,600	7.3
HsB	Houdek-Stickney complex, 2 to 6 percent slopes	7,829	1.4
Ht	Houdek-Stickney-Tetonka complex	20,425	3.6
Hv	Hoven silt loam	304	0.1
Lh	La Prairie-Holmquist loams, channeled	1,636	0.3
Lm	Lamoure silty clay loam	2,078	0.4
Lo	Lowe loam	2,268	0.4
Ma	Marysland loam	2,469	0.5
MeA	Minnewasta sandy loam, 0 to 2 percent slopes	113	0.1
Mw	Minnewaukan loamy sand	652	0.1
Od	Oldham silty clay loam	9,354	1.7
Og	Orthents, gravelly	777	0.1
Pa	Parnell silty clay loam	6,190	1.1
Pm	Playmoor silty clay loam	1,500	0.3
PoB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes	74,472	13.3
PoC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes	20,755	3.8
PrB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes	1,863	0.3
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes	12,727	2.3
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes	48,081	8.7
RfA	Renshaw-Fordville loams, 0 to 2 percent slopes	4,814	0.9
RfB	Renshaw-Fordville loams, 2 to 6 percent slopes	4,405	0.8
RsB	Renshaw-Sioux complex, 2 to 6 percent slopes	4,192	0.8
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes	1,748	0.3

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
SnA	Sinai silty clay, 0 to 2 percent slopes	1,925	0.3
SrD	Sioux-Renshaw complex, 9 to 15 percent slopes	287	0.1
Ss	Southam silty clay loam	12,788	2.3
St	Stickney-Dudley silt loams	444	0.1
Sv	Stickney-Dudley-Hoven silt loams	27,870	4.9
TdD	Talmo-Delmont loams, 6 to 15 percent slopes	165	0.1
Te	Tetonka silt loam	2,884	0.5
To	Tonka silty clay loam	2,257	0.4
VbA	Vienna-Brookings complex, 0 to 2 percent slopes	837	0.1
VbB	Vienna-Brookings complex, 1 to 6 percent slopes	2,203	0.4
Wa	Waubay silty clay loam	6,407	1.2
Wb	Waubay-Badger silty clay loams	3,767	0.7
Wo	Worthing silty clay loam	1,696	0.3
Wp	Worthing silty clay loam, ponded	31,230	5.6
	Water	785	0.1
	Total	553,005	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Ba	Badger silty clay loam (where drained)
BcB	Barnes-Buse loams, 2 to 6 percent slopes
BdA	Beadle loam, 0 to 2 percent slopes (where irrigated)
BdB	Beadle loam, 2 to 6 percent slopes (where irrigated)
Bn	Bon loam
BrB	Brandt silty clay loam, 2 to 6 percent slopes
CbA	Clarno-Bonilla loams, 0 to 2 percent slopes (where irrigated)
CbB	Clarno-Bonilla loams, 1 to 6 percent slopes (where irrigated)
CeB	Clarno-Ethan-Bonilla loams, 1 to 6 percent slopes (where irrigated)
Ct	Crossplain-Tetonka complex (where drained)
Cu	Cubden silty clay loam
Cv	Cubden-Badger silty clay loams (where drained)
Cw	Cubden-Tonka silty clay loams (where drained)
Dc	Davison-Crossplain complex (where drained)
DeA	Delmont loam, 0 to 2 percent slopes (where irrigated)
Dv	Divide loam
EgA	Egeland-Embden complex, 0 to 2 percent slopes
EgB	Egeland-Embden complex, 2 to 6 percent slopes
HbB	Henkin-Blendon fine sandy loams, 2 to 6 percent slopes (where irrigated)
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
HpA	Houdek-Prosper loams, 0 to 2 percent slopes (where irrigated)
HpB	Houdek-Prosper loams, 1 to 6 percent slopes (where irrigated)
Ht	Houdek-Stickney-Tetonka complex (where drained)
Lm	Lamoure silty clay loam (where drained)
Lo	Lowe loam (where drained)
Ma	Marysland loam (where drained)
PoB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PrB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
RfA	Renshaw-Fordville loams, 0 to 2 percent slopes (where irrigated)
RfB	Renshaw-Fordville loams, 2 to 6 percent slopes (where irrigated)
SnA	Sinai silty clay, 0 to 2 percent slopes
Te	Tetonka silt loam (where drained)
To	Tonka silty clay loam (where drained)
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
Wa	Waubay silty clay loam
Wb	Waubay-Badger silty clay loams (where drained)

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Sunflowers	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Lbs	Tons	AUM*
Ba------------------------ Badger	78	28	30	52	1,300	1.8	3.3
Bb------------------------ Baltic	26	4	9	6	460	---	0.4
BcB----------------------- Barnes-Buse	70	32	26	59	1,170	2.9	3.0
BcC----------------------- Barnes-Buse	56	27	21	49	930	2.5	2.6
BdA----------------------- Beadle	69	33	27	60	1,230	2.7	2.8
BdB----------------------- Beadle	61	29	24	53	1,090	2.5	2.5
BdC----------------------- Beadle	48	25	19	46	860	2.2	2.3
BeA----------------------- Beadle-Dudley	52	26	20	48	930	2.1	2.2
Bn------------------------ Bon	78	33	31	61	1,410	2.5	3.3
Bo------------------------ Bon	27	9	11	17	480	1.3	2.2
BrB----------------------- Brandt	76	34	30	63	1,280	3.0	3.1
BuC----------------------- Buse-Barnes	55	26	20	48	910	2.5	2.6
BuD----------------------- Buse-Barnes	38	19	14	35	630	2.1	2.2
BxD----------------------- Buse-Holmquist	24	10	8	19	380	1.1	1.5
CbA----------------------- Clarno-Bonilla	78	36	31	67	1,410	3.1	3.1
CbB----------------------- Clarno-Bonilla	73	34	29	63	1,310	2.9	3.0
CeB----------------------- Clarno-Ethan-Bonilla	68	32	26	59	1,230	2.8	2.9
CeC----------------------- Clarno-Ethan-Bonilla	58	28	22	52	1,040	2.5	2.6
Ct------------------------ Crossplain-Tetonka	64	22	25	41	1,150	1.2	2.4

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Sunflowers	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Lbs	Tons	AUM*
Cu------------------------ Cubden	78	29	26	53	1,300	2.6	3.1
Cv------------------------ Cubden-Badger	78	29	28	53	1,300	2.2	3.1
Cw------------------------ Cubden-Tonka	70	24	24	43	1,170	1.9	2.5
Dc------------------------ Davison-Crossplain	70	27	25	50	1,260	1.9	2.8
DeA----------------------- Delmont	25	17	10	30	500	1.7	1.7
DtB----------------------- Delmont-Talmo	16	13	7	24	330	1.4	1.4
Dv------------------------ Divide	65	26	21	47	1,090	2.3	2.8
Dx------------------------ Dudley-Jerauld	20	13	7	22	340	0.9	1.1
Dy------------------------ Durrstein	4	1	1	1	60	---	0.2
EgA----------------------- Egeland-Embden	60	28	23	52	1,040	2.6	2.7
EgB----------------------- Egeland-Embden	53	26	21	48	940	2.5	2.6
EmC----------------------- Egeland-Maddock	41	21	16	39	720	2.2	2.3
EnD----------------------- Ethan-Betts	28	16	10	29	500	1.7	1.8
EoD----------------------- Ethan-Bon	28	13	10	24	510	1.6	1.9
EtC----------------------- Ethan-Clarno	51	25	19	46	910	2.3	2.4
EtD----------------------- Ethan-Clarno	34	19	13	34	620	1.9	2.0
HbB----------------------- Henkin-Blendon	50	26	20	47	940	2.3	2.4
HeA----------------------- Hetland	84	37	33	68	1,410	3.2	3.3
HeB----------------------- Hetland	77	34	30	63	1,280	3.1	3.2
HpA----------------------- Houdek-Prosper	77	35	30	65	1,380	3.0	3.1

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Sunflowers	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Lbs	Tons	AUM*
HpB: Houdek-Prosper	70	33	28	61	1,260	2.9	2.9
HsA: Houdek-Stickney	68	32	27	59	1,230	2.6	2.7
HsB: Houdek-Stickney	65	31	25	56	1,160	2.6	2.7
Ht: Houdek-Stickney-Tetonka	65	28	26	52	1,170	2.2	2.4
Hv: Hoven	4	1	1	1	60	---	0.2
Lh: La Prairie-Holmquist	22	6	8	11	350	0.8	1.8
Lm: Lamoure	67	25	22	45	1,120	1.2	3.3
Lo: Lowe	53	15	17	27	880	0.6	2.8
Ma: Marysland	44	12	14	21	740	0.4	2.5
MeA: Minnewasta	35	12	14	21	580	0.4	2.4
Mw: Minnewaukan	38	18	15	32	640	1.5	1.8
Od: Oldham	28	4	10	6	460	---	0.5
Og: Orthents	5	6	2	11	110	0.9	0.9
Pa: Parnell	28	4	11	7	460	---	0.5
Pm: Playmoor	28	6	8	10	370	0.1	1.3
PoB: Poinsett-Buse-Waubay	80	35	30	65	1,330	3.2	3.3
PoC: Poinsett-Buse-Waubay	69	31	26	58	1,150	2.9	3.0
PrB: Poinsett-Rusklyn-Waubay	79	35	30	65	1,320	3.2	3.3
PwA: Poinsett-Waubay	92	40	36	74	1,540	3.6	3.7
PwB: Poinsett-Waubay	87	38	34	70	1,450	3.5	3.5

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Sunflowers	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Lbs	Tons	AUM*
RfA----------------------- Renshaw-Fordville	36	21	14	38	640	2.0	2.1
RfB----------------------- Renshaw-Fordville	30	19	12	34	540	1.9	1.9
RsB----------------------- Renshaw-Sioux	18	14	7	25	340	1.6	1.6
RsC----------------------- Renshaw-Sioux	12	11	5	19	230	1.3	1.4
SnA----------------------- Sinai	78	34	30	62	1,300	3.1	3.2
SrD----------------------- Sioux-Renshaw	5	6	2	11	120	0.9	1.0
Ss------------------------ Southam	5	1	1	1	80	---	0.1
St------------------------ Stickney-Dudley	45	23	17	41	800	1.8	2.0
Sv------------------------ Stickney-Dudley-Hoven	34	17	13	30	600	1.3	1.5
TdD----------------------- Talmo-Delmont	4	6	2	10	110	0.8	0.9
Te------------------------ Tetonka	51	12	20	23	910	0.4	1.5
To------------------------ Tonka	55	13	21	24	910	0.5	1.6
VbA----------------------- Vienna-Brookings	86	38	33	70	1,430	3.4	3.4
VbB----------------------- Vienna-Brookings	80	35	31	66	1,330	3.3	3.3
Wa------------------------ Waubay	96	41	37	76	1,600	4.1	4.0
Wb------------------------ Waubay-Badger	88	35	34	66	1,460	3.0	3.5
Wo------------------------ Worthing	26	4	10	7	460	---	0.4
Wp------------------------ Worthing	4	---	2	1	80	---	0.1

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Clayey	Little bluestem	30	4,000	3,300	2,300
Beadle: BdA, BdB, BdC, BeA	Big bluestem	20			
Sinai: SnA	Needlegrasses	20			
Stickney: HsA, HsB, Ht, St, Sv	Western wheatgrass	5			
	Sideoats grama	5			
	Blue grama	5			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
Claypan	Western wheatgrass	35	3,100	2,600	1,800
Dudley: BeA, Dx, St, Sv	Needlegrasses	20			
	Big bluestem	10			
	Blue grama	10			
	Bluegrasses	10			
	Switchgrass	5			
	Sedges	5			
	Climax forbs	5			
Closed Depression	Western wheatgrass	70	3,800	3,500	2,400
Hoven: Hv, Sv	Sedges	10			
	Bluegrasses	5			
	Saltgrass	5			
	Buffalograss	5			
	Climax forbs	5			
Limy Subirrigated	Little bluestem	40	5,300	4,400	2,800
Cubden: Cu, Cv, Cw	Big bluestem	20			
Davison: Dc	Needlegrasses	20			
Divide: Dv	Blue grama	5			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
Loamy Overflow	Big bluestem	60	5,500	4,600	3,200
Badger: Ba, Cv, Wb	Sedges	10			
Bon: Bn, Bo, EoD	Switchgrass	5			
Bonilla: CbA, CbB, CeB	Canada wildrye	5			
Brookings: VbA, VbB	Porcupinegrass	5			
Crossplain: Ct, Dc	Little bluestem	5			
La Prairie: Lh	Sideoats grama	5			
Prosper: HpA, HpB	Climax forbs	5			
Waubay: PoB, PrB, PwA, PwB, Wa, Wb					
Saline Lowland	Cordgrass	55	4,800	4,400	3,500
Durrstein: Dy	Nuttall alkaligrass	15			
	Western wheatgrass	10			
	Saltgrass	10			
	Switchgrass	5			
	Sedges	5			
Saline Subirrigated	Little bluestem	45	5,300	4,400	3,100
Holmquist: BxD, Lh	Big bluestem	20			
Playmoor: Pm	Indiangrass	10			
	Switchgrass	10			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Sandy--------------------	Big bluestem or sand bluestem	30	3,900	3,200	2,200
Blendon: HbB	Little bluestem--------------	20			
Egeland: EgA, EgB, EmC	Prairie sandreed-------------	10			
Embden: EgA, EgB	Needlegrasses----------------	10			
Henkin: HbB	Sideoats grama---------------	5			
Maddock: EmC	Sedges-----------------------	5			
	Climax forbs-----------------	5			
Shallow Marsh------------	Sedges-----------------------	45	7,400	6,800	5,400
Parnell: Pa	Rivergrass-------------------	30			
Worthing: Wo	Climax forbs-----------------	10			
	American mannagrass----------	5			
	Reedgrasses------------------	5			
	Prairie cordgrass------------	5			
Shallow to Gravel--------	Needleandthread--------------	45	2,900	2,400	1,400
Delmont: DeA, DtB, TdD	Little bluestem--------------	10			
Renshaw: RfA, RfB, RsB, RsC, SrD	Prairie dropseed-------------	10			
	Blue grama or hairy grama----	10			
	Plains muhly-----------------	5			
	Bluegrasses------------------	5			
	Sedges-----------------------	5			
	Climax forbs-----------------	5			
	Climax shrubs----------------	5			
Silty--------------------	Little bluestem--------------	30	4,200	3,500	2,400
Barnes: BcB, BcC, BuC, BuD	Big bluestem-----------------	20			
Bonilla: CeC	Needlegrasses----------------	20			
Brandt: BrB	Prairie dropseed-------------	5			
Clarno: CbA, CbB, CeB, CeC, EtC, EtD	Blue grama-------------------	5			
Fordville: RfA, RfB	Bluegrasses------------------	5			
Hetland: HeA, HeB	Sedges-----------------------	5			
Houdek: HpA, HpB, HsA, HsB, Ht	Climax forbs-----------------	5			
Poinsett: PoB, PoC, PrB, PwA, PwB	Climax shrubs----------------	5			
Vienna: VbA, VbB					
Waubay: PoC					
Subirrigated-------------	Big bluestem-----------------	50	5,900	5,400	6,500
Lamoure: Lm	Indiangrass------------------	10			
Lowe: Lo	Little bluestem--------------	10			
Marysland: Ma	Switchgrass------------------	10			
Minnewasta: MeA	Canada wildrye---------------	5			
Minnewaukan: Mw	Prairie cordgrass------------	5			
	Sedges-----------------------	5			
	Climax forbs-----------------	5			
Thin Claypan-------------	Western wheatgrass-----------	55	1,700	1,400	800
Jerauld: Dx	Blue grama-------------------	25			
	Buffalograss-----------------	5			
	Saltgrass--------------------	5			
	Sedges-----------------------	5			
	Climax forbs-----------------	5			

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Thin Upland	Little bluestem	35	3,500	2,900	2,000
Betts: EnD	Needlegrasses	20			
Buse: BcB, BcC, BuC,	Big bluestem	10			
BuD, BxD, PoB, PoC	Prairie dropseed	10			
Ethan: CeB, CeC, EnD,	Sideoats grama	5			
EoD, EtC, EtD	Blue grama	5			
Rusklyn: PrB	Sedges	5			
	Climax forbs	5			
	Climax shrubs	5			
Very Shallow	Needleandthread	55	2,200	1,900	1,100
Orthents: Og	Blue grama or hairy grama	20			
Sioux: RsB, RsC, SrD	Sedges	10			
Talmo: DtB, TdD	Plains muhly	5			
	Sideoats grama	5			
	Climax shrubs	5			
Wetland	Prairie cordgrass	60	7,000	6,400	5,100
Baltic: Bb	Reedgrasses	10			
Oldham: Od	Reed canarygrass	10			
	Sedges	5			
	Switchgrass	5			
	Canada wildrye	5			
	Bluegrasses	5			
Wet Meadow	Sedges	40	5,000	4,600	3,200
Tetonka: Ct, Ht, Te	Reedgrasses	15			
Tonka: Cw, To	Prairie cordgrass	15			
	Reed canarygrass	10			
	Western wheatgrass	5			
	Bluegrasses	5			
	Rushes	5			
	Climax forbs	5			

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(In Kingsbury County, none of the soils are assigned to windbreak suitability group 7. The symbol < means less than; > means more than. Dashes indicate that trees generally do not grow to the given height on the soils in that group)

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 1----------- Bon: Bn, Bo, EoD Bonilla: CbA, CbB, CeB, CeC Brookings: VbA, VbB Cubden: Cu, Cv, Cw Davison: Dc Divide: Dv Embden: EgA, EgB La Prairie: Lh Prosper: HpA, HpB Waubay: PoB, PoC, PrB, PwA, PwB, Wa, Wb	Golden currant, Hansen hedgerose, juneberry, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	American plum, Amur maple, Arnold hawthorn, common chokecherry, common lilac, European cotoneaster, late lilac, sargent crabapple, Siberian apricot, Siberian peashrub, silver buffaloberry, Ussurian pear.	Austrian pine, blue spruce, bur oak, eastern redcedar, ponderosa pine, Rocky Mountain juniper, Russian-olive, Russian mulberry, Scotch pine, Siberian crabapple, Siberian larch, white spruce.	Golden willow, green ash, hackberry, silver maple*, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, robusta poplar, Siberian elm.
Group 2----------- Badger: Ba, Cv, Wb Crossplain: Ct, Dc Lamoure: Lm Minnewaukan: Mw	American plum, Amur honeysuckle, common lilac, golden currant, Hansen hedgerose, juneberry, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, silver buffaloberry.	Amur maple, Arnold hawthorn, common chokecherry, European cotoneaster, sargent crabapple, Siberian apricot, Siberian peashrub, Ussurian pear.	Austrian pine, Black Hills spruce, blue spruce, bur oak, eastern redcedar, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, white spruce.	Golden willow, green ash, hackberry, silver maple*, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar.
Group 3----------- Barnes: BcB, BcC, BuC, BuD Brandt: BrB Clarno: CbA, CbB, CeB, CeC, EtC, EtD Houdek: HpA, HpB, HsA, HsB, Ht Poinsett: PoB, PoC, PrB, PwA, PwB Vienna: VbA, VbB	Amur honeysuckle, golden currant, Hansen hedgerose, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, skunkbush sumac, western sandcherry.	American plum, Amur maple, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, European cotoneaster, Manchurian apricot, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, silver buffaloberry.	Austrian pine, Black Hills spruce, blue spruce, bur oak, hackberry, Manchurian crabapple, ponderosa pine, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white poplar, white spruce.	Green ash, silver maple.	Siberian elm.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 4----------- Beadle: BdA, BdB, BdC, BeA Hetland: HeA, HeB Sinai: SnA Stickney: HsA, HsB, Ht, St, Sv	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, skunkbush sumac.	American plum, Amur honeysuckle, common chokecherry, common lilac, eastern redcedar, Manchurian apricot, Manchurian crabapple, Rocky Mountain juniper, Siberian apricot, Siberian crabapple, Siberian peashrub, silver buffaloberry, Ussurian pear.	Bur oak, hackberry, ponderosa pine, Russian-olive.	Green ash, Siberian elm, silver maple.	---
Group 5----------- Blendon: HbB Egeland: EgA, EgB, EmC Henkin: HbB Maddock: EmC	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac, western sandcherry.	American plum, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, Ussurian pear.	Bur oak, green ash, hackberry, Manchurian crabapple, ponderosa pine, Russian-olive, Siberian crabapple, white poplar.	Siberian elm------	---
Group 6----------- Delmont: DeA, DtB, TdD Fordville: RfA, RfB Renshaw: RfA, RfB, RsB, RsC	Amur honeysuckle, common lilac, European cotoneaster, Peking cotoneaster, Siberian peashrub, silver buffaloberry.	Eastern redcedar, hackberry, Manchurian crabapple, Rocky Mountain juniper, Siberian crabapple, Ussurian pear.	Bur oak, green ash, ponderosa pine, Russian-olive.	Siberian elm------	---
Group 8----------- Betts: EnD Buse: BcB, BcC, BuC, BxD, PoB, PoC Ethan: CeB, CeC, EnD, EoD, EtC, EtD Rusklyn: PrB	American plum, Amur honeysuckle, common lilac, European cotoneaster, golden currant, Peking cotoneaster, Siberian peashrub, silver buffaloberry, skunkbush sumac.	Eastern redcedar, hackberry, Rocky Mountain juniper, Russian-olive, Ussurian pear.	Green ash, ponderosa pine, Siberian elm.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 9 Dudley: BeA, Dx, St, Sv	Amur honeysuckle, common lilac, eastern redcedar, Rocky Mountain juniper, Russian almond, Siberian peashrub, silver buffaloberry, Ussurian pear.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---	---	---
Group 10 Baltic: Bb Buse: BuD Durrstein: Dy Holmquist: BxD, Lh Hoven: Hv, Sv Jerauld: Dx Lowe: Lo Marysland: Ma Minnewasta: MeA Oldham: Od Orthents: Og Parnell: Pa Playmoor: Pm Renshaw: SrD Sioux: RsB, RsC, SrD Southam: Ss Talmo: DtB, TdD Tetonka: Ct, Ht, Te Tonka: Cw, To Worthing: Wo, Wp	None	None	None	None	None.

* Silver maple is not adapted to Cubden, Davison, Divide, or Lamoure soils because of the calcareous surface layer of these soils.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ba: Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Bb: Baltic	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
BcB:				
Barnes	Slight	Slight	Moderate: slope, small stones.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
BcC:				
Barnes	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
BdA: Beadle	Slight	Slight	Slight	Slight.
BdB: Beadle	Slight	Slight	Moderate: slope.	Slight.
BdC: Beadle	Slight	Slight	Severe: slope.	Slight.
BeA:				
Beadle	Slight	Slight	Slight	Slight.
Dudley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Bn: Bon	Severe: flooding.	Slight	Slight	Slight.
Bo: Bon	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
BrB: Brandt	Slight	Slight	Moderate: slope.	Slight.
BuC:				
Buse	Slight	Slight	Severe: slope.	Slight.
Barnes	Slight	Slight	Severe: slope.	Slight.
BuD:				
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BuD:				
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BxD:				
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Holmquist	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
CbA:				
Clarno	Slight	Slight	Slight	Slight.
Bonilla	Severe: wetness.	Slight	Moderate: wetness.	Slight.
CbB:				
Clarno	Slight	Slight	Moderate: slope.	Slight.
Bonilla	Severe: wetness.	Slight	Moderate: wetness.	Slight.
CeB:				
Clarno	Slight	Slight	Moderate: slope.	Slight.
Ethan	Slight	Slight	Moderate: slope.	Slight.
Bonilla	Severe: wetness.	Slight	Moderate: wetness.	Slight.
CeC:				
Clarno	Slight	Slight	Severe: slope.	Slight.
Ethan	Slight	Slight	Severe: slope.	Slight.
Bonilla	Slight	Slight	Moderate: slope.	Slight.
Ct:				
Crossplain	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Tetonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Cu Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Cv:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cw:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dc:				
Davison	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Crossplain	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
DeA Delmont	Slight	Slight	Slight	Slight.
DtB:				
Delmont	Slight	Slight	Moderate: slope.	Slight.
Talmo	Slight	Slight	Moderate: slope.	Slight.
Dv Divide	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Dx:				
Dudley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Jerauld	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Dy Durrstein	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, excess salt.	Severe: wetness, flooding, percs slowly.	Severe: wetness.
EgA:				
Egeland	Slight	Slight	Slight	Slight.
Embden	Slight	Slight	Slight	Slight.
EgB:				
Egeland	Slight	Slight	Moderate: slope.	Slight.
Embden	Slight	Slight	Moderate: slope.	Slight.
EmC:				
Egeland	Slight	Slight	Severe: slope.	Slight.
Maddock	Slight	Slight	Severe: slope.	Slight.
EnD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
EnD:				
Betts	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
EoD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Bon	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
EtC:				
Ethan	Slight	Slight	Severe: slope.	Slight.
Clarno	Slight	Slight	Severe: slope.	Slight.
EtD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Clarno	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
HbB:				
Henkin	Slight	Slight	Moderate: slope, small stones.	Slight.
Blendon	Slight	Slight	Moderate: slope.	Slight.
HeA Hetland	Slight	Slight	Slight	Slight.
HeB Hetland	Slight	Slight	Moderate: slope.	Slight.
HpA:				
Houdek	Slight	Slight	Slight	Slight.
Prosper	Severe: wetness.	Slight	Moderate: wetness.	Slight.
HpB:				
Houdek	Slight	Slight	Moderate: slope.	Slight.
Prosper	Severe: wetness.	Slight	Moderate: wetness.	Slight.
HsA:				
Houdek	Slight	Slight	Slight	Slight.
Stickney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
HsB:				
Houdek	Slight	Slight	Moderate: slope.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
HsB:				
Stickney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Ht:				
Houdek	Slight	Slight	Slight	Slight.
Stickney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Tetonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Hv: Hoven	Severe: ponding, percs slowly, excess sodium.	Severe: ponding, excess sodium, percs slowly.	Severe: ponding, percs slowly, excess sodium.	Severe: ponding.
Lh:				
La Prairie	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Holmquist	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Lm: Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lo: Lowe	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ma: Marysland	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MeA: Minnewasta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mw: Minnewaukan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Od: Oldham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Og: Orthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Pa: Parnell	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pm: Playmoor	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
PoB:				
Poinsett	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PoC:				
Poinsett	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
Waubay	Slight	Slight	Moderate: slope.	Slight.
PrB:				
Poinsett	Slight	Slight	Moderate: slope.	Slight.
Rusklyn	Slight	Slight	Moderate: slope.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PwA:				
Poinsett	Slight	Slight	Slight	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PwB:				
Poinsett	Slight	Slight	Moderate: slope.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
RfA:				
Renshaw	Slight	Slight	Slight	Slight.
Fordville	Slight	Slight	Slight	Slight.
RfB:				
Renshaw	Slight	Slight	Moderate: slope.	Slight.
Fordville	Slight	Slight	Moderate: slope.	Slight.
RsB:				
Renshaw	Slight	Slight	Moderate: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
RsC:				
Renshaw	Slight	Slight	Severe: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
SnA Sinai	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Slight.
SrD:				
Sioux	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Renshaw	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Ss Southam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
St:				
Stickney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Dudley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Sv:				
Stickney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Dudley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Hoven	Severe: ponding, percs slowly, excess sodium.	Severe: ponding, excess sodium, percs slowly.	Severe: ponding, percs slowly, excess sodium.	Severe: ponding.
TdD:				
Talmo	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Delmont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Te Tetonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
To Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
VbA:				
Vienna	Slight	Slight	Slight	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
VbB:				
Vienna	Slight	Slight	Moderate: slope.	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Wa: Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Wb:				
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Wo, Wp: Worthing	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Ba----- Badger	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Bb----- Baltic	Very poor.	Poor	Poor	Very poor.	Good	Very poor.	Good	Fair	Fair.
BcB:									
Barnes-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BcC:									
Barnes-----	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Buse-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BdA----- Beadle	Good	Fair	Good	Good	Poor	Very poor.	Good	Very poor.	Very poor.
BdB----- Beadle	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BdC----- Beadle	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
BeA:									
Beadle-----	Good	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Dudley-----	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Bn----- Bon	Good	Good	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
Bo----- Bon	Very poor.	Good	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
BrB----- Brandt	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BuC:									
Buse-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Barnes-----	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
BuD:									
Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Barnes-----	Poor	Good	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
BxD:									
Buse	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Holmquist	Very poor.	Poor	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
CbA, CbB:									
Clarno	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Bonilla	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
CeB:									
Clarno	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Ethan	Fair	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Bonilla	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
CeC:									
Clarno	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Ethan	Poor	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Bonilla	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Ct:									
Crossplain	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Tetonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
Cu: Cubden	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Cv:									
Cubden	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Badger	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Cw:									
Cubden	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Tonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
Dc:									
Davison	Good	Good	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Dc:									
Crossplain	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
DeA Delmont	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
DtB:									
Delmont	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Dv Divide	Fair	Fair	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
Dx:									
Dudley	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Jerauld	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Dy Durrstein	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
EgA, EgB:									
Egeland	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Embden	Fair	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
EmC:									
Egeland	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Maddock	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
EnD:									
Ethan	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Betts	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
EoD:									
Ethan	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Bon	Very poor.	Very poor.	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
EtC:									
Ethan	Poor	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Clarno	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba-ceous plants	Planted woody plants	Native decid-uous trees	Native conif-erous plants	Native shrubs	Wetland plants	Shallow water areas
EtD:									
Ethan	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Clarno	Poor	Good	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
HbB:									
Henkin	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Blendon	Fair	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
HeA, HeB: Hetland	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
HpA, HpB:									
Houdek	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Prosper	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
HsA, HsB:									
Houdek	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Stickney	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Ht:									
Houdek	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Stickney	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Tetonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
Hv: Hoven	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
Lh:									
La Prairie	Very poor.	Very poor.	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
Holmquist	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair	Fair.
Lm: Lamoure	Poor	Poor	Fair	Good	Good	Poor	Good	Fair	Fair.
Lo: Lowe	Fair	Good	Fair	Good	Good	Poor	Good	Fair	Fair.
Ma: Marysland	Poor	Poor	Fair	Good	Good	Poor	Good	Fair	Fair.
MeA: Minnewasta	Poor	Good	Fair	Very poor.	Poor	Very poor.	Poor	Poor	Poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Mw------------------ Minnewaukan	Poor	Good	Fair	Good	Poor	Very poor.	Poor	Fair	Fair.
Od------------------ Oldham	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
Og------------------ Orthents	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Pa------------------ Parnell	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
Pm------------------ Playmoor	Poor	Poor	Fair	Very poor.	Fair	Very poor.	Fair	Fair	Fair.
PoB:									
Poinsett-----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse---------------	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.
Waubay-------------	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
PoC:									
Poinsett-----------	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse---------------	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Waubay-------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
PrB:									
Poinsett-----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Rusklyn------------	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Waubay-------------	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.
PwA, PwB:									
Poinsett-----------	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Waubay-------------	Good	Good	Fair	Good	Poor	Poor	Fair	Very poor.	Very poor.
RfA:									
Renshaw------------	Fair	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Fordville----------	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
RfB:									
Renshaw------------	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
RfB:									
Fordville	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
RsB, RsC:									
Renshaw	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SnA Sinai	Good	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
SrD:									
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Renshaw	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Ss Southam	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
St:									
Stickney	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Dudley	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Sv:									
Stickney	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Dudley	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Hoven	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
TdD:									
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Delmont	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Te Tetonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
To Tonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
VbA, VbB:									
Vienna	Good	Good	Good	Good	Good	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba- ceous plants	Planted woody plants	Native decid- uous trees	Native conif- erous plants	Native shrubs	Wetland plants	Shallow water areas
Wa------------------ Waubay	Good	Good	Fair	Good	Good	Very poor.	Fair	Very poor.	Very poor.
Wb:									
Waubay------------	Good	Good	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
Badger------------	Good	Good	Fair	Good	Fair	Very poor.	Fair	Poor	Poor.
Wo------------------ Worthing	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
Wp------------------ Worthing	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ba----------------- Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Bb----------------- Baltic	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
BcB, BcC:					
Barnes------------	Slight------------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Buse--------------	Slight------------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
BdA, BdB, BdC------ Beadle	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
BeA:					
Beadle------------	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Dudley------------	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Bn----------------- Bon	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Bo----------------- Bon	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.
BrB---------------- Brandt	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
BuC:					
Buse--------------	Slight------------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Barnes------------	Slight------------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BuD:					
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Barnes	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
BxD:					
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Holmquist	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.
CbA:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Bonilla	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
CbB:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Bonilla	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
CeB:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Bonilla	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
CeC:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
CeC:					
Bonilla	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Ct:					
Crossplain	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Tetonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Cu Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Cv:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Cw:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Dc:					
Davison	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Crossplain	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
DeA Delmont	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
DtB:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Talmo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Dv----------------- Divide	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.
Dx:					
Dudley------------	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Jerauld-----------	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Dy----------------- Durrstein	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
EgA:					
Egeland-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight------------	Slight.
Embden------------	Severe: cutbanks cave.	Slight-----------	Moderate: wetness.	Slight------------	Moderate: frost action.
EgB:					
Egeland-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
Embden------------	Severe: cutbanks cave.	Slight-----------	Moderate: wetness.	Moderate: slope.	Moderate: frost action.
EmC:					
Egeland-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
Maddock-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
EnD:					
Ethan-------------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Betts-------------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
EoD:					
Ethan-------------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Bon---------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.
EtC:					
Ethan-------------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EtC:					
Clarno-----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
EtD:					
Ethan------------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Clarno-----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
HbB:					
Henkin-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action.
Blendon----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action.
HeA, HeB---------- Hetland	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
HpA:					
Houdek-----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Prosper----------	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.
HpB:					
Houdek-----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Prosper----------	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.
HsA:					
Houdek-----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Stickney---------	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
HsB:					
Houdek-----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Stickney---------	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ht:					
Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Stickney	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Tetonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Hv Hoven	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Lh:					
La Prairie	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Holmquist	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.
Lm Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lo Lowe	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Ma Marysland	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
MeA Minnewasta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.
Mw Minnewaukan	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.
Od Oldham	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Og Orthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pa----------------- Parnell	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Pm----------------- Playmoor	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
PoB:					
Poinsett---------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse-------------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay-----------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PoC:					
Poinsett---------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse-------------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay-----------	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
PrB:					
Poinsett---------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Rusklyn----------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay-----------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PwA:					
Poinsett---------	Slight-----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Waubay-----------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
PwB:					
Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
RfA:					
Renshaw	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Fordville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
RfB:					
Renshaw	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Fordville	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
RsB, RsC:					
Renshaw	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Sioux	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
SnA Sinai	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
SrD:					
Sioux	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Renshaw	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Ss Southam	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
St:					
Stickney	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Dudley	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Sv:					
Stickney	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Sv:					
Dudley	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Hoven	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
TdD:					
Talmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Delmont	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Te: Tetonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
To: Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
VbA:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VbB:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
Wa: Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
Wb:					
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Wo, Wp------------ Worthing	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ba------------------ Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Bb------------------ Baltic	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
BcB:					
Barnes-------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Buse---------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
BcC:					
Barnes-------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Buse---------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
BdA----------------- Beadle	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
BdB----------------- Beadle	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
BdC----------------- Beadle	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
BeA:					
Beadle-------------	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Dudley-------------	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Bn------------------ Bon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness.
Bo------------------ Bon	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BrB----------------- Brandt	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey, thin layer.
BuC:					
Buse---------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Barnes-------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
BuD:					
Buse---------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Barnes-------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BxD:					
Buse---------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Holmquist----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
CbA:					
Clarno-------------	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Bonilla------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
CbB:					
Clarno-------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Bonilla------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
CeB:					
Clarno-------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Ethan--------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Bonilla------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
CeC:					
Clarno-------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CeC:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Bonilla	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey.
Ct:					
Crossplain	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Tetonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Cu Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Cv:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Cw:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Dc:					
Davison	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Crossplain	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
DeA Delmont	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DtB:					
Delmont	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Talmo	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Dv: Divide	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Dx:					
Dudley	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Jerauld	Severe: wetness, percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
Dy: Durrstein	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
EgA, EgB:					
Egeland	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
Embden	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
EmC:					
Egeland	Slight	Severe: seepage, slope.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
Maddock	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EnD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Betts	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
EoD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EoD:					
Bon	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
EtC:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Clarno	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
EtD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Clarno	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
HbB:					
Henkin	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
HeA Hetland	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: hard to pack.
HeB Hetland	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
HpA:					
Houdek	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Prosper	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
HpB:					
Houdek	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Prosper	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
HsA:					
Houdek	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Stickney	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HsB:					
Houdek	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Stickney	Severe: wetness, percs slowly.	Moderate: slope, wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Ht:					
Houdek	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Stickney	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Tetonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Hv: Hoven	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, excess sodium.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Lh:					
La Prairie	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
Holmquist	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lm: Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Lo: Lowe	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ma: Marysland	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
MeA: Minnewasta	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Mw: Minnewaukan	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
Od: Oldham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Og------------------ Orthents	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Pa------------------ Parnell	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Pm------------------ Playmoor	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
PoB:					
Poinsett-----------	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Buse---------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Waubay-------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PoC:					
Poinsett-----------	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Buse---------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Waubay-------------	Severe: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
PrB:					
Poinsett-----------	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Rusklyn------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Waubay-------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PwA:					
Poinsett-----------	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Waubay-------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PwB:					
Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
RfA, RfB:					
Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
RsB:					
Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
RsC:					
Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SnA Sinai	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SrD:					
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ss Southam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
St:					
Stickney	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Dudley	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Sv:					
Stickney	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Dudley	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Hoven	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, excess sodium.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
TdD:					
Talmo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Delmont	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Te: Tetonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
To: Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
VbA:					
Vienna	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VbB:					
Vienna	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wa------------------ Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
Wb:					
Waubay-------------	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
Badger-------------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Wo, Wp-------------- Worthing	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ba-------------------- Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Bb-------------------- Baltic	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BcB, BcC:				
Barnes----------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse------------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
BdA, BdB, BdC--------- Beadle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BeA:				
Beadle----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Dudley----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Bn-------------------- Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bo-------------------- Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BrB------------------- Brandt	Good------------------	Probable--------------	Probable--------------	Poor: area reclaim.
BuC:				
Buse------------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Barnes----------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BuD:				
Buse------------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Barnes----------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BxD:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Holmquist	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CbA, CbB:				
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Bonilla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
CeB, CeC:				
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Bonilla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ct:				
Crossplain	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Tetonka	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Cu Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Cv:				
Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Cw:				
Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Dc:				
Davison	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Dc:				
Crossplain	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
DeA: Delmont	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
DtB:				
Delmont	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Talmo	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Dv: Divide	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Dx:				
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Jerauld	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Dy: Durrstein	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
EgA, EgB:				
Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
Embden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
EmC:				
Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
Maddock	Good	Probable	Improbable: too sandy.	Poor: too sandy.
EnD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EnD:				
Betts	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
EoD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
EtC:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
EtD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
HbB:				
Henkin	Good	Probable	Improbable: too sandy.	Fair: small stones.
Blendon	Good	Probable	Improbable: too sandy.	Fair: small stones.
HeA, HeB Hetland	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HpA, HpB:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Prosper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HsA, HsB:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Stickney	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ht:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Stickney	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Tetonka	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Hv: Hoven	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
Lh:				
La Prairie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Holmquist	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lm: Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lo: Lowe	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ma: Marysland	Poor: wetness.	Probable	Probable	Poor: wetness.
MeA: Minnewasta	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mw: Minnewaukan	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, wetness.
Od: Oldham	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Og: Orthents	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Pa: Parnell	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pm------------------- Playmoor	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
PoB, PoC:				
Poinsett-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Buse-----------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Waubay---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PrB:				
Poinsett-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rusklyn--------------	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Waubay---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PwA, PwB:				
Poinsett-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Waubay---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
RfA, RfB:				
Renshaw--------------	Good-----------------	Probable-------------	Probable-------------	Poor: too sandy, small stones, area reclaim.
Fordville------------	Good-----------------	Probable-------------	Probable-------------	Poor: too sandy, small stones, area reclaim.
RsB, RsC:				
Renshaw--------------	Good-----------------	Probable-------------	Probable-------------	Poor: too sandy, small stones, area reclaim.
Sioux----------------	Good-----------------	Probable-------------	Probable-------------	Poor: too sandy, small stones, area reclaim.
SnA------------------ Sinai	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SrD:				
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Ss: Southam	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
St:				
Stickney	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Sv:				
Stickney	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Hoven	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
TdD:				
Talmo	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Delmont	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Te: Tetonka	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
To: Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VbA, VbB:				
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wa Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wb:				
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Wo, Wp Worthing	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Ba: Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Bb: Baltic	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
BcB, BcC:						
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BdA: Beadle	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Erodes easily	Erodes easily, percs slowly.
BdB, BdC: Beadle	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
BeA:						
Beadle	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Erodes easily	Erodes easily, percs slowly.
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Bn: Bon	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Bo: Bon	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
BrB: Brandt	Severe: seepage.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BuC:						
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BuD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BxD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BxD:						
Holmquist	Moderate: seepage.	Severe: piping, wetness.	Flooding	Wetness, flooding.	Wetness	Wetness.
CbA:						
Clarno	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Bonilla	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
CbB:						
Clarno	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Bonilla	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
CeB:						
Clarno	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Bonilla	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
CeC:						
Clarno	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Bonilla	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Ct:						
Crossplain	Slight	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Tetonka	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Cu Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Cv:						
Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Cv:						
Badger-----------	Slight---------	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cw:						
Cubden-----------	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
Tonka------------	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Dc:						
Davison----------	Moderate: seepage.	Severe: piping.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
Crossplain-------	Slight---------	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
DeA--------------- Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, rooting depth.	Too sandy------	Droughty, rooting depth.
DtB:						
Delmont----------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Too sandy------	Droughty, rooting depth.
Talmo------------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy------	Droughty.
Dv---------------- Divide	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness--------	Wetness, too sandy.	Favorable.
Dx:						
Dudley-----------	Slight---------	Severe: excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Jerauld----------	Slight---------	Severe: hard to pack, excess sodium.	Deep to water	Droughty-------	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
Dy---------------- Durrstein	Slight---------	Severe: hard to pack, wetness, excess sodium.	Percs slowly, flooding, excess salt.	Wetness, droughty, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess salt, excess sodium.
EgA:						
Egeland----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty-------	Too sandy, soil blowing.	Droughty.
Embden-----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
EgB:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Embden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
EmC:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Maddock	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
EnD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Betts	Severe: slope.	Moderate: piping.	Deep to water	Slope, excess salt.	Slope, erodes easily.	Slope, erodes easily.
EoD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Bon	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
EtC:						
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Clarno	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
EtD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Clarno	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
HbB:						
Henkin	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty.	Soil blowing	Droughty.
Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
HeA Hetland	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
HeB: Hetland	Moderate: slope.	Moderate: piping, hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
HpA:						
Houdek	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Prosper	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
HpB:						
Houdek	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Prosper	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
HsA:						
Houdek	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Stickney	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
HsB:						
Houdek	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Stickney	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Ht:						
Houdek	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Stickney	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Tetonka	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Hv: Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Ponding, percs slowly, excess salt.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, excess sodium, erodes easily.
Lh:						
La Prairie	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Holmquist	Moderate: seepage.	Severe: piping, wetness.	Flooding	Wetness, flooding.	Wetness	Wetness.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Lm----------------- Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Lo----------------- Lowe	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Ma----------------- Marysland	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
MeA---------------- Minnewasta	Slight---------	Severe: piping, wetness.	Percs slowly, frost action.	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
Mw----------------- Minnewaukan	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Od----------------- Oldham	Slight---------	Severe: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Og----------------- Orthents	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty, rooting depth.
Pa----------------- Parnell	Slight---------	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Pm----------------- Playmoor	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding, excess salt.	Wetness, too sandy.	Wetness, excess salt.
PoB:						
Poinsett---------	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Buse-------------	Moderate: slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Waubay-----------	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable------	Erodes easily	Erodes easily.
PoC:						
Poinsett---------	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Buse-------------	Moderate: slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Waubay-----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
PrB:						
Poinsett----------	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Rusklyn----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Waubay-----------	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable------	Erodes easily	Erodes easily.
PwA:						
Poinsett----------	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Waubay-----------	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable------	Erodes easily	Erodes easily.
PwB:						
Poinsett----------	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Waubay-----------	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable------	Erodes easily	Erodes easily.
RfA:						
Renshaw----------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-------	Too sandy------	Droughty.
Fordville---------	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth	Too sandy------	Rooting depth.
RfB:						
Renshaw----------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy------	Droughty.
Fordville---------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, rooting depth.	Too sandy------	Rooting depth.
RsB, RsC:						
Renshaw----------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy------	Droughty.
Sioux------------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy------	Droughty.
SnA--------------- Sinai	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
SrD:						
Sioux------------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Renshaw----------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ss: Southam	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
St:						
Stickney	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Sv:						
Stickney	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Ponding, percs slowly, excess salt.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, excess sodium, erodes easily.
TdD:						
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Delmont	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
Te: Tetonka	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
To: Tonka	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
VbA:						
Vienna	Slight	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
VbB:						
Vienna	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Wa: Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
Wb:						
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Wo: Worthing	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Wp: Worthing	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ba----------------Badger	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	9-35	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	35-55	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	55-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-95	30-45	10-25
Bb----------------Baltic	0-10	Silty clay loam	CL, CH	A-7	0	100	100	90-100	85-100	40-65	15-35
	10-36	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-70	20-40
	36-60	Silty clay, silty clay loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	95-100	80-100	65-100	35-70	15-35
BcB, BcC:											
Barnes-----------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	20-40	5-20
	7-13	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	13-27	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Buse-------------	0-9	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	9-25	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	25-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
BdA, BdB, BdC-----Beadle	0-7	Loam-------------	CL, CL-ML	A-6, A-7, A-4	0-5	95-100	95-100	85-100	65-95	25-45	5-20
	7-21	Clay loam, clay	CL, CH	A-7	0-5	90-100	85-100	75-95	55-95	40-60	15-35
	21-60	Clay loam, clay	CL, CH, ML, MH	A-6, A-7	0-5	90-100	85-100	75-95	55-85	35-55	15-25
BeA:											
Beadle-----------	0-7	Loam-------------	CL, CL-ML	A-6, A-7, A-4	0-5	95-100	95-100	85-100	65-95	25-45	5-20
	7-21	Clay loam, clay	CL, CH	A-7	0-5	90-100	85-100	75-95	55-95	40-60	15-35
	21-60	Clay loam, clay	CL, CH, ML, MH	A-6, A-7	0-5	90-100	85-100	75-95	55-85	35-55	15-25
Dudley-----------	0-9	Silt loam--------	CL, ML	A-6, A-7	0	95-100	95-100	90-100	70-90	35-45	10-20
	9-21	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-36	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	36-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
Bn----------------Bon	0-20	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	80-95	55-85	25-40	5-15
	20-50	Stratified silty clay loam to fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-95	60-85	23-40	3-15
	50-60	Stratified silty clay loam to loamy fine sand.	ML, SM, SC, CL	A-4, A-6, A-7	0	95-100	95-100	75-95	45-95	25-45	3-22

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Bo----------------- Bon	0-20	Loam---------------	CL-ML, CL	A-4, A-6	0	100	90-100	80-95	60-85	25-40	5-15
	20-50	Stratified silty clay loam to fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-95	60-85	23-40	3-15
	50-60	Stratified silty clay loam to fine sandy loam.	ML, SM, CL, CL-ML	A-4, A-6, A-7	0	95-100	95-100	75-95	45-95	25-45	3-22
BrB---------------- Brandt	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	8-23	Silty clay loam, silt loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-100	35-50	8-23
	23-41	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	85-100	60-100	30-40	5-15
	41-60	Stratified sand to very gravelly loam.	SM, GM, GM-GC, GP-GM	A-1, A-2	0-5	50-80	30-70	20-50	5-35	15-25	NP-5
BuC, BuD: Buse--------------	0-9	Loam---------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	9-25	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	25-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Barnes------------	0-7	Loam---------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	20-40	5-20
	7-13	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	13-27	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
BxD: Buse--------------	0-9	Loam---------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	9-25	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	25-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Holmquist---------	0-4	Loam---------------	CL	A-6	0	100	95-100	85-95	55-80	30-40	10-15
	4-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-6, A-7, A-4	0	100	95-100	75-95	50-80	25-45	5-20
CbA, CbB: Clarno------------	0-12	Loam---------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	12-25	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	25-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	41-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
Bonilla-----------	0-9	Loam---------------	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-80	25-40	5-20
	9-25	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	60-90	30-50	10-25
	25-30	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
	30-60	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
CeB: Clarno------------	0-12	Loam---------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	12-25	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	25-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	41-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CeB:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-24	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	24-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Bonilla---------	0-9	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-80	25-40	5-20
	9-25	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	60-90	30-50	10-25
	25-30	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
	30-60	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
CeC:											
Clarno----------	0-12	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	12-25	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	25-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	41-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-24	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	24-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Bonilla---------	0-9	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-90	25-40	5-20
	9-25	Loam, clay loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-90	30-50	10-25
	25-30	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-25
	30-60	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-25
Ct:											
Crossplain------	0-10	Clay loam--------	CL, ML	A-6, A-7	0	100	100	90-100	70-80	35-45	10-20
	10-35	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-90	40-55	15-30
	35-53	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-45	10-25
	53-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-25
Tetonka---------	0-10	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	8-20
	10-21	Silty clay loam, loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	30-50	10-25
	21-48	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-100	40-70	15-35
	48-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	80-100	55-95	30-60	11-30
Cu--------------- Cubden	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	28-41	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
	41-60	Clay loam, loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-30
Cv:											
Cubden----------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	28-41	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
	41-60	Clay loam, loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Cv:											
Badger----------	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	9-35	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	35-55	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	55-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-95	30-45	10-25
Cw:											
Cubden----------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	28-41	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
	41-60	Clay loam, loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-30
Tonka-----------	0-19	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	30-45	10-25
	19-51	Silty clay loam, clay loam, clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	51-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
Dc:											
Davison---------	0-9	Loam-------------	CL	A-6	0	95-100	95-100	85-95	60-85	25-40	10-20
	9-24	Loam, clay loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0-5	95-100	95-100	85-100	45-80	25-40	5-20
	24-40	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	60-80	25-40	5-20
	40-60	Stratified clay loam to sandy loam.	CL-ML, SC, CL, SC-SM	A-4, A-6	0-5	90-100	80-100	65-95	40-75	20-35	5-15
Crossplain------	0-10	Clay loam--------	CL, ML	A-6, A-7	0	100	100	90-100	70-80	35-45	10-20
	10-35	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-90	40-55	15-30
	35-53	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-45	10-25
	53-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-25
DeA------------- Delmont	0-9	Loam-------------	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	9-18	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	18-60	Very gravelly sand, very gravelly loamy sand, gravelly sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5
DtB:											
Delmont---------	0-9	Loam-------------	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	9-18	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	18-60	Very gravelly sand, very gravelly loamy sand, gravelly sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
DtB:											
Talmo	0-7	Loam	ML, CL	A-4, A-6	0-5	95-100	90-100	85-100	55-75	30-40	5-15
	7-60	Extremely gravelly loamy sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
Dv Divide	0-10	Loam	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	60-85	25-40	5-20
	10-26	Loam, clay loam, gravelly loam.	CL, CL-ML, SC-SM, SC	A-4, A-6, A-7	0-3	95-100	75-100	55-90	35-80	20-45	5-20
	26-60	Stratified sand to gravelly sand.	GM, SM, GP-GM, SP-SM	A-1, A-3, A-2-4	0-5	25-100	15-100	10-70	5-25	0-30	NP-5
Dx:											
Dudley	0-9	Silt loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	70-90	35-45	10-20
	9-21	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-36	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	36-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
Jerauld	0-2	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	2-14	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	14-30	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	30-60	Silty clay, clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
Dy Durrstein	0-2	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	3-15
	2-19	Silty clay, clay, clay loam.	CH, MH	A-7	0	95-100	95-100	85-100	65-95	50-85	20-50
	19-60	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	85-100	60-95	40-75	15-50
EgA, EgB:											
Egeland	0-9	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	9-35	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	35-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Embden	0-17	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	60-95	30-65	15-35	NP-10
	17-36	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	36-60	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	50-80	15-50	---	NP
EmC:											
Egeland	0-9	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	9-35	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	35-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EmC:											
Maddock---------	0-9	Sandy loam-------	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	9-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	---	NP
EnD:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-24	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	24-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Betts-----------	0-4	Loam-------------	CL	A-6	0-5	90-100	80-100	75-100	60-75	30-40	10-20
	4-31	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
EoD:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-24	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	24-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Bon-------------	0-32	Loam-------------	CL-ML, CL	A-4, A-6	0	100	90-100	80-95	60-85	25-40	5-15
	32-46	Stratified silty clay loam to fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-95	60-85	23-40	3-15
	46-60	Stratified silty clay loam to fine sandy loam.	ML, SM, CL, CL-ML	A-4, A-6, A-7	0	95-100	95-100	75-95	45-95	25-45	3-22
EtC, EtD:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-24	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	24-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Clarno----------	0-12	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	12-25	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	25-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	41-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
HbB:											
Henkin----------	0-8	Fine sandy loam	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-55	15-30	NP-10
	8-26	Loam, sandy loam, fine sandy loam.	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-60	15-30	NP-10
	26-44	Sandy loam, fine sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0-5	90-100	80-100	65-90	30-60	15-30	NP-10
	44-60	Stratified fine sand to clay loam.	SM, SC, SP-SM, SC-SM	A-2, A-4, A-1, A-3	0-5	90-100	80-100	35-95	5-50	15-35	NP-10

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
HbB:											
Blendon----------	0-8	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	8-22	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0	100	85-100	60-100	20-60	20-33	NP-10
	22-42	Fine sandy loam, sandy loam, loamy sand.	SM	A-4, A-2	0	100	85-100	60-100	20-45	20-30	NP-5
	42-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SC-SM, SC	A-2, A-4	0	85-100	75-100	50-100	10-45	15-30	NP-10
HeA, HeB---------- Hetland	0-8	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-35
	8-23	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	20-35
	23-41	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	15-30
	41-60	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	11-30
HpA, HpB:											
Houdek-----------	0-8	Loam-------------	CL	A-4, A-6, A-7	0-5	95-100	95-100	85-100	70-85	30-45	8-20
	8-18	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	18-38	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	38-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Prosper----------	0-13	Loam-------------	CL	A-4, A-6	0	95-100	95-100	80-100	50-90	28-35	9-15
	13-23	Clay loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	23-38	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
	38-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
HsA, HsB:											
Houdek-----------	0-8	Loam-------------	CL	A-4, A-6, A-7	0-5	95-100	95-100	85-100	70-85	30-45	8-20
	8-18	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	18-38	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	38-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Stickney---------	0-11	Silt loam--------	CL, ML	A-6, A-7, A-4	0	95-100	95-100	85-100	85-95	30-50	8-20
	11-20	Clay loam, silty clay loam, clay.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-95	40-60	14-34
	20-60	Clay loam, loam	CL, CH, MH, ML	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-60	10-35
Ht:											
Houdek-----------	0-8	Loam-------------	CL	A-4, A-6, A-7	0-5	95-100	95-100	85-100	70-85	30-45	8-20
	8-18	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	18-38	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	38-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Stickney---------	0-11	Silt loam--------	CL, ML	A-6, A-7, A-4	0	95-100	95-100	85-100	85-95	30-50	8-20
	11-20	Clay loam, silty clay loam, clay.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-95	40-60	14-34
	20-60	Clay loam, loam	CL, CH, MH, ML	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-60	10-35

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ht:											
Tetonka---------	0-10	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	8-20
	10-21	Silty clay loam, loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	30-50	10-25
	21-48	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-100	40-70	15-35
	48-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	80-100	55-95	30-60	11-30
Hv--------------- Hoven	0-2	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	2-5	Silty clay, clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	5-34	Silty clay, clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	34-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45
Lh:											
La Prairie------	0-14	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	14-26	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	26-42	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-90	25-50	5-25
	42-60	Stratified fine sandy loam to silty clay loam.	CL-ML, CL, SC, SC-SM	A-4, A-6, A-7	0	100	95-100	75-100	45-90	25-50	5-25
Holmquist-------	0-4	Loam-------------	CL	A-6	0	100	95-100	85-95	55-80	30-40	10-15
	4-60	Stratified loamy sand to clay loam.	CL-ML, CL	A-6, A-7, A-4	0	100	95-100	75-95	50-80	25-45	5-20
Lm--------------- Lamoure	0-25	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	45-70	20-35
	25-40	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	85-100	40-70	15-35
	40-48	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7	0	95-100	95-100	90-100	75-100	30-50	10-20
	48-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	70-95	35-90	30-50	10-25
Lo--------------- Lowe	0-4	Loam-------------	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-75	30-45	5-20
	4-23	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-85	35-50	11-25
	23-60	Stratified silty clay loam to loamy sand.	ML, CL, SM, SC	A-4, A-6, A-7	0	100	100	85-100	45-75	30-45	5-20
Ma--------------- Marysland	0-12	Loam-------------	CL	A-6, A-7	0	95-100	95-100	85-95	50-80	30-50	10-25
	12-36	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	80-95	45-80	20-40	10-20
	36-60	Stratified fine sand to gravelly coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-90	35-70	5-20	---	NP

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
MeA---------------- Minnewasta	0-5	Sandy loam--------	SM, SC-SM	A-4, A-2	0-5	100	100	80-100	20-55	10-28	NP-10
	5-13	Loamy coarse sand, loamy fine sand, gravelly sand.	SP, SM, SC, CL	A-1, A-2	0-5	60-95	50-90	20-60	0-55	0-20	NP-10
	13-60	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-7, A-4, A-6	0-5	100	95-100	90-100	70-95	25-45	5-25
Mw---------------- Minnewaukan	0-6	Loamy sand--------	SM	A-2	0	90-100	70-100	50-85	15-30	0-20	NP-10
	6-60	Sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	90-100	70-100	60-100	5-35	0-20	NP-10
Od---------------- Oldham	0-8	Silty clay loam	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	40-60	15-25
	8-38	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	85-100	40-60	15-25
	38-60	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	70-100	25-45	5-20
Og---------------- Orthents	0-10	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	10-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Pa---------------- Parnell	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	10-48	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	48-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
Pm---------------- Playmoor	0-6	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-60	12-25
	6-33	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	80-100	35-60	12-25
	33-60	Stratified loamy sand to silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-60	12-25
PoB, PoC: Poinsett---------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	24-48	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	48-60	Clay loam---------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Buse-------------	0-9	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	9-25	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	25-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
PoB, PoC:											
Waubay----------	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-42	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	42-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
PrB:											
Poinsett--------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	24-48	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	48-60	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Rusklyn---------	0-8	Silty clay loam	CL	A-6, A-7	0-5	100	95-100	95-100	85-100	30-50	10-25
	8-34	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	34-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
Waubay----------	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-42	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	42-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
PwA, PwB:											
Poinsett--------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	24-48	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	48-60	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Waubay----------	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-42	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	42-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
RfA, RfB:											
Renshaw---------	0-8	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	8-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Fordville-------	0-6	Loam-------------	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	6-17	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	17-24	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	24-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
RsB, RsC:											
Renshaw---------	0-8	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	8-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Sioux-----------	0-8	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	8-13	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	13-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
SnA------------- Sinai	0-8	Silty clay-------	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	45-70	20-35
	8-23	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	23-38	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	38-60	Stratified silty clay to silt loam.	CL, CH	A-7	0	100	100	95-100	80-95	40-65	15-35
SrD:											
Sioux-----------	0-8	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	8-13	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	13-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SrD:											
Renshaw----------	0-8	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	8-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Ss--------------- Southam	0-12	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-50	10-25
	12-25	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-100	40-75	15-50
	25-60	Silty clay, silty clay loam, clay loam.	CL, CH, CL-ML	A-6, A-7, A-4	0	100	95-100	85-100	60-100	20-75	5-50
St:											
Stickney---------	0-11	Silt loam--------	CL, ML	A-6, A-7, A-4	0	95-100	95-100	85-100	85-95	30-50	8-20
	11-20	Clay loam, silty clay loam, clay.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-95	40-60	14-34
	20-60	Clay loam, loam	CL, CH, MH, ML	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-60	10-35
Dudley-----------	0-9	Silt loam--------	CL, ML	A-6, A-7	0	95-100	95-100	90-100	70-90	35-45	10-20
	9-21	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-36	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	36-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
Sv:											
Stickney---------	0-11	Silt loam--------	CL, ML	A-6, A-7, A-4	0	95-100	95-100	85-100	85-95	30-50	8-20
	11-20	Clay loam, silty clay loam, clay.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-95	40-60	14-34
	20-60	Clay loam, loam	CL, CH, MH, ML	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-60	10-35
Dudley-----------	0-9	Silt loam--------	CL, ML	A-6, A-7	0	95-100	95-100	90-100	70-90	35-45	10-20
	9-21	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-36	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	36-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
Hoven------------	0-2	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	2-5	Silty clay, clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	5-34	Silty clay, clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	34-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
TdD:											
Talmo-----------	0-7	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	85-100	55-75	30-40	5-15
	7-60	Extremely gravelly loamy sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
Delmont---------	0-9	Loam-------------	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	9-18	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	18-60	Very gravelly sand, very gravelly loamy sand, gravelly loamy sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5
Te--------------- Tetonka	0-10	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	8-20
	10-21	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	30-50	10-25
	21-48	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-100	40-70	15-35
	48-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	80-100	55-95	30-60	11-30
To--------------- Tonka	0-19	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	30-45	10-25
	19-51	Silty clay loam, clay loam, clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	51-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
VbA, VbB:											
Vienna----------	0-8	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	8-16	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	16-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	32-60	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Brookings-------	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	17-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-39	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	39-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
Wa--------------- Waubay	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-42	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	42-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Wb:											
Waubay----------	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-42	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	42-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
Badger----------	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	9-35	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	35-55	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	55-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-95	30-45	10-25
Wo--------------- Worthing	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	10-45	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	45-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30
Wp--------------- Worthing	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	10-45	Silty clay, clay	CH	A-7	0	100	100	95-100	80-100	50-70	25-40
	45-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Ba---------------- Badger	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	9-35	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	35-55	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
	55-60	20-35	1.50-1.70	0.06-0.2	0.14-0.20	7.4-8.4	0-4	Moderate	0.37			
Bb---------------- Baltic	0-10	27-40	1.15-1.25	0.2-0.6	0.16-0.20	7.4-8.4	0-0	Moderate	0.37	5	4L	4-8
	10-36	35-60	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	2-4	High------	0.28			
	36-60	30-50	1.25-1.45	0.06-0.6	0.08-0.17	7.4-8.4	2-4	High------	0.32			
BcB, BcC:												
Barnes-----------	0-7	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low-------	0.24	5	6	3-7
	7-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	13-27	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	27-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse-------------	0-9	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0-0	Low-------	0.28	5	4L	1-3
	9-25	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	25-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
BdA, BdB, BdC---- Beadle	0-7	20-26	1.10-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.32	5	6	2-4
	7-21	35-45	1.30-1.45	0.06-0.6	0.13-0.16	6.6-8.4	0-2	High------	0.32			
	21-60	27-45	1.50-1.70	0.2-0.6	0.13-0.17	7.4-8.4	2-4	Moderate	0.37			
BeA:												
Beadle-----------	0-7	20-26	1.10-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.32	5	6	2-4
	7-21	35-45	1.30-1.45	0.06-0.6	0.13-0.16	6.6-8.4	0-2	High------	0.32			
	21-60	27-45	1.50-1.70	0.2-0.6	0.13-0.17	7.4-8.4	2-4	Moderate	0.37			
Dudley-----------	0-9	18-25	1.00-1.20	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	9-21	35-50	1.35-1.45	0.01-0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32			
	21-36	30-50	1.40-1.50	0.06-0.2	0.13-0.19	7.4-9.0	8-16	High------	0.32			
	36-60	20-35	1.55-1.65	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.37			
Bn---------------- Bon	0-20	20-27	1.20-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Low-------	0.24	5	6	4-6
	20-50	15-30	1.25-1.40	0.6-2.0	0.13-0.17	7.4-8.4	0-2	Low-------	0.32			
	50-60	10-30	1.25-1.40	0.6-6.0	0.11-0.16	7.4-8.4	0-2	Low-------	0.32			
Bo---------------- Bon	0-20	20-27	1.20-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Low-------	0.24	5	6	4-6
	20-50	15-30	1.25-1.40	0.6-2.0	0.13-0.17	7.4-8.4	0-2	Low-------	0.32			
	50-60	15-30	1.25-1.40	0.6-6.0	0.11-0.16	7.4-8.4	0-2	Low-------	0.32			
BrB--------------- Brandt	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	4	7	4-8
	8-23	25-35	1.20-1.35	0.6-2.0	0.17-0.21	6.1-7.8	0-2	Moderate	0.32			
	23-41	20-30	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	41-60	5-10	1.60-1.75	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
BuC, BuD:												
Buse-------------	0-9	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0-0	Low-------	0.28	5	4L	1-3
	9-25	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	25-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Barnes-----------	0-7	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low-------	0.24	5	6	3-7
	7-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	13-27	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	27-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BxD:												
Buse-------------	0-9	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0-0	Low--------	0.28	5	4L	1-3
	9-25	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	25-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Holmquist--------	0-4	18-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	2-4	Low--------	0.24	5	4L	3-6
	4-60	12-35	1.30-1.60	0.6-2.0	0.12-0.20	7.4-9.0	4-8	Moderate	0.28			
CbA, CbB:												
Clarno-----------	0-12	20-27	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low--------	0.24	5	6	2-4
	12-25	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	25-41	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	41-60	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
Bonilla----------	0-9	20-27	1.15-1.30	0.6-2.0	0.17-0.19	5.6-7.3	0-2	Low--------	0.24	5	6	4-6
	9-25	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.28			
	25-30	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
	30-60	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
CeB:												
Clarno-----------	0-12	20-27	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low--------	0.24	5	6	2-4
	12-25	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	25-41	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	41-60	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
Ethan------------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	8-24	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	24-60	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Bonilla----------	0-9	20-27	1.15-1.30	0.6-2.0	0.17-0.19	5.6-7.3	0-2	Low--------	0.24	5	6	4-6
	9-25	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.28			
	25-30	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
	30-60	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
CeC:												
Clarno-----------	0-12	20-27	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low--------	0.24	5	6	2-4
	12-25	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	25-41	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	41-60	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
Ethan------------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	8-24	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	24-60	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Bonilla----------	0-9	20-27	1.15-1.30	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low--------	0.24	5	6	4-6
	9-25	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.24			
	25-30	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.28			
	30-60	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Ct:												
Crossplain-------	0-10	27-35	1.25-1.35	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	6	3-6
	10-35	35-45	1.25-1.45	0.06-0.6	0.11-0.17	6.1-7.3	0-2	High-------	0.32			
	35-53	25-35	1.50-1.70	0.06-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	53-60	25-35	1.50-1.70	0.06-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.37			
Tetonka----------	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	6	4-8
	10-21	25-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	21-48	35-60	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-------	0.28			
	48-60	30-50	1.35-1.50	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High-------	0.32			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Cu---------------- Cubden	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-28	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	28-41	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
	41-60	20-34	1.35-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Cv:												
Cubden-----------	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-28	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	28-41	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
	41-60	20-34	1.35-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Badger-----------	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	9-35	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	35-55	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
	55-60	20-35	1.50-1.70	0.06-0.2	0.14-0.20	7.4-8.4	0-4	Moderate	0.37			
Cw:												
Cubden-----------	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-28	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	28-41	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
	41-60	20-34	1.35-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Tonka------------	0-19	27-39	1.10-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Moderate	0.37	5	7	5-10
	19-51	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High------	0.43			
	51-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
Dc:												
Davison----------	0-9	18-26	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	2-6
	9-24	18-30	1.20-1.35	0.6-2.0	0.13-0.17	7.4-9.0	0-2	Moderate	0.37			
	24-40	18-30	1.25-1.35	0.6-2.0	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
	40-60	15-30	1.30-1.45	0.2-2.0	0.10-0.18	7.4-8.4	2-8	Moderate	0.37			
Crossplain-------	0-10	27-35	1.25-1.35	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	6	3-6
	10-35	35-45	1.25-1.45	0.06-0.6	0.11-0.17	6.1-7.3	0-2	High------	0.32			
	35-53	25-35	1.50-1.70	0.06-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	53-60	25-35	1.50-1.70	0.06-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.37			
DeA--------------- Delmont	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	9-18	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	18-60	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
DtB:												
Delmont----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	9-18	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	18-60	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Talmo------------	0-7	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.6-7.8	0-0	Low-------	0.28	2	6	2-4
	7-60	0-10	1.45-1.65	6.0-20	0.03-0.06	7.4-8.4	0-0	Low-------	0.05			
Dv---------------- Divide	0-10	15-27	1.10-1.40	0.6-2.0	0.18-0.22	7.4-8.4	0-0	Low-------	0.24	4	4L	2-8
	10-26	18-30	1.20-1.50	0.6-2.0	0.16-0.19	7.4-8.4	0-0	Low-------	0.20			
	26-60	0-10	1.30-1.70	6.0-20	0.03-0.07	7.4-8.4	0-0	Low-------	0.10			
Dx:												
Dudley-----------	0-9	18-25	1.00-1.20	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	9-21	35-50	1.35-1.45	0.01-0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32			
	21-36	30-50	1.40-1.50	0.06-0.2	0.13-0.19	7.4-9.0	8-16	High------	0.32			
	36-60	20-35	1.55-1.65	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Dx:												
Jerauld----------	0-2	15-25	1.10-1.25	0.6-2.0	0.18-0.22	5.6-7.3	0-4	Low--------	0.37	2	6	1-3
	2-14	35-60	1.15-1.30	0.01-0.2	0.10-0.15	6.6-8.4	2-8	High-------	0.37			
	14-30	35-60	1.15-1.30	0.06-0.2	0.10-0.15	7.9-9.0	4-16	High-------	0.37			
	30-60	27-45	1.35-1.60	0.06-0.2	0.08-0.13	7.4-9.0	4-16	High-------	0.32			
Dy---------------- Durrstein	0-2	10-26	1.15-1.30	0.6-2.0	0.19-0.22	6.1-7.3	4-16	Low--------	0.37	2	6	1-3
	2-19	35-60	1.20-1.35	0.01-0.2	0.10-0.15	6.6-9.0	4-16	High-------	0.37			
	19-60	35-55	1.35-1.50	0.01-0.2	0.08-0.13	7.4-9.6	4-16	High-------	0.37			
EgA, EgB:												
Egeland----------	0-9	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low--------	0.20	5	3	1-3
	9-35	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low--------	0.20			
	35-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low--------	0.17			
Embden-----------	0-17	10-18	1.40-1.60	2.0-6.0	0.13-0.18	6.1-7.3	0-0	Low--------	0.20	5	3	4-7
	17-36	10-18	1.40-1.60	2.0-6.0	0.12-0.17	6.6-7.8	0-0	Low--------	0.20			
	36-60	5-18	1.40-1.60	2.0-6.0	0.06-0.16	7.4-8.4	0-0	Low--------	0.24			
EmC:												
Egeland----------	0-9	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low--------	0.20	5	3	1-3
	9-35	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low--------	0.20			
	35-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low--------	0.17			
Maddock----------	0-9	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0-0	Low--------	0.20	5	3	1-3
	9-60	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0-0	Low--------	0.17			
EnD:												
Ethan------------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	8-24	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	24-60	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Betts------------	0-4	18-27	1.20-1.30	0.6-2.0	0.16-0.18	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	4-31	20-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.32			
	31-60	20-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37			
EoD:												
Ethan------------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	8-24	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	24-60	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Bon--------------	0-32	20-27	1.20-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Low--------	0.24	5	6	4-6
	32-46	15-30	1.25-1.40	0.6-2.0	0.13-0.17	7.4-8.4	0-2	Low--------	0.32			
	46-60	15-30	1.25-1.40	0.6-6.0	0.11-0.16	7.4-8.4	0-2	Low--------	0.32			
EtC, EtD:												
Ethan------------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	8-24	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	24-60	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Clarno-----------	0-12	20-27	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low--------	0.24	5	6	2-4
	12-25	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	25-41	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	41-60	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
HbB:												
Henkin-----------	0-8	10-20	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low--------	0.20	5	3	1-3
	8-26	7-18	1.20-1.45	2.0-6.0	0.09-0.18	5.6-7.8	0-2	Low--------	0.20			
	26-44	7-18	1.25-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low--------	0.24			
	44-60	3-27	1.35-1.65	0.6-6.0	0.08-0.16	6.1-8.4	0-2	Low--------	0.24			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
HbB:												
Blendon---------	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	2-4
	8-22	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	0-2	Low-------	0.20			
	22-42	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-8.4	0-2	Low-------	0.24			
	42-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	0-2	Low-------	0.24			
HeA, HeB--------- Hetland	0-8	35-45	1.20-1.30	0.06-0.2	0.13-0.19	5.6-7.3	0-2	High------	0.37	5	4	4-7
	8-23	35-50	1.20-1.40	0.06-0.2	0.11-0.19	5.6-7.3	0-2	High------	0.37			
	23-41	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High------	0.37			
	41-60	25-40	1.25-1.45	0.06-0.6	0.11-0.20	6.6-8.4	0-4	High------	0.37			
HpA, HpB:												
Houdek----------	0-8	15-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	5	6	2-4
	8-18	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	18-38	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	38-60	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
Prosper---------	0-13	18-26	1.15-1.25	0.6-2.0	0.17-0.19	5.6-7.8	0-0	Low-------	0.24	5	6	4-6
	13-23	27-35	1.20-1.30	0.6-2.0	0.19-0.22	6.6-7.8	0-0	Moderate	0.28			
	23-38	20-30	1.30-1.60	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.28			
	38-60	20-30	1.45-1.65	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37			
HsA, HsB:												
Houdek----------	0-8	15-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	5	6	2-4
	8-18	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	18-38	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	38-60	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
Stickney--------	0-11	20-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-------	0.37	5	6	2-4
	11-20	35-45	1.20-1.35	0.06-0.2	0.16-0.19	6.1-7.8	4-16	High------	0.37			
	20-60	20-35	1.50-1.70	0.06-0.6	0.14-0.18	7.4-9.0	4-16	Moderate	0.37			
Ht:												
Houdek----------	0-8	15-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	5	6	2-4
	8-18	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	18-38	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	38-60	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
Stickney--------	0-11	20-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-------	0.37	5	6	2-4
	11-20	35-45	1.20-1.35	0.06-0.2	0.16-0.19	6.1-7.8	4-16	High------	0.37			
	20-60	20-35	1.50-1.70	0.06-0.6	0.14-0.18	7.4-9.0	4-16	Moderate	0.37			
Tetonka---------	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	6	4-8
	10-21	25-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	21-48	35-60	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High------	0.28			
	48-60	30-50	1.35-1.50	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
Hv--------------- Hoven	0-2	22-26	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	2-5	35-60	1.15-1.30	0.01-0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37			
	5-34	35-60	1.15-1.30	0.01-0.06	0.10-0.19	6.6-8.4	4-16	High------	0.37			
	34-60	35-60	1.30-1.50	0.01-0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37			
Lh:												
La Prairie------	0-14	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-------	0.24	5	6	2-6
	14-26	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Moderate	0.32			
	26-42	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.32			
	42-60	18-30	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.28			
Holmquist-------	0-4	18-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	2-4	Low-------	0.24	5	4L	3-6
	4-60	12-35	1.30-1.60	0.6-2.0	0.12-0.20	7.4-9.0	4-8	Moderate	0.28			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Lm----------------- Lamoure	0-25	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	25-40	25-34	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	40-48	25-34	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.43			
	48-60	20-34	1.25-1.40	0.2-2.0	0.09-0.18	7.4-8.4	0-4	Low--------	0.28			
Lo----------------- Lowe	0-4	24-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low--------	0.24	5	4L	5-8
	4-23	24-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	23-60	10-30	1.35-1.50	0.6-2.0	0.13-0.19	7.4-8.4	0-4	Moderate	0.28			
Ma----------------- Marysland	0-12	18-30	1.20-1.30	0.6-2.0	0.17-0.22	7.9-8.4	0-2	Moderate	0.24	4	4L	1-6
	12-36	18-30	1.35-1.50	0.6-2.0	0.15-0.19	7.9-8.4	0-2	Moderate	0.32			
	36-60	1-5	1.55-1.65	6.0-20	0.02-0.07	7.9-8.4	0-2	Low--------	0.10			
MeA---------------- Minnewasta	0-5	10-18	1.40-1.60	2.0-6.0	0.11-0.17	6.6-8.4	0-2	Low--------	0.24	5	3	2-6
	5-13	3-15	1.40-1.60	6.0-20	0.03-0.10	7.4-9.0	0-4	Low--------	0.10			
	13-60	18-40	1.30-1.60	0.06-0.2	0.08-0.16	7.9-9.0	2-8	Moderate	0.37			
Mw----------------- Minnewaukan	0-6	1-10	1.35-1.50	6.0-20	0.04-0.10	6.6-7.8	2-4	Low--------	0.17	5	2	2-6
	6-60	1-5	1.40-1.70	6.0-20	0.04-0.12	7.4-8.4	2-4	Low--------	0.15			
Od----------------- Oldham	0-8	35-40	1.15-1.30	0.2-0.6	0.13-0.19	6.6-7.8	0-4	High-------	0.37	5	4	4-7
	8-38	35-45	1.25-1.40	0.06-0.6	0.14-0.20	7.4-8.4	0-4	High-------	0.37			
	38-60	20-40	1.30-1.50	0.06-0.6	0.14-0.20	7.4-8.4	0-2	Moderate	0.43			
Og----------------- Orthents	0-10	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low--------	0.20	3	5	.5-3
	10-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low--------	0.10			
Pa----------------- Parnell	0-10	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	10-48	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-------	0.37			
	48-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-------	0.43			
Pm----------------- Playmoor	0-6	27-34	1.15-1.30	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28	5	4L	4-8
	6-33	20-34	1.20-1.35	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28			
	33-60	20-34	1.20-1.40	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.28			
PoB, PoC:												
Poinsett---------	0-10	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	10-24	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	24-48	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	48-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Buse-------------	0-9	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0-0	Low--------	0.28	5	4L	1-3
	9-25	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	25-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Waubay-----------	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-42	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
PrB:												
Poinsett---------	0-10	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	10-24	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	24-48	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	48-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Rusklyn----------	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.6-7.8	0-2	Moderate	0.32	5	4L	1-4
	8-34	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.32			
	34-60	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
PrB:												
Waubay----------	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-42	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
PwA, PwB:												
Poinsett--------	0-10	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	10-24	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	24-48	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	48-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Waubay----------	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-42	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
RfA, RfB:												
Renshaw---------	0-8	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
Fordville-------	0-6	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	4	6	3-7
	6-17	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	17-24	15-30	1.25-1.45	0.6-6.0	0.12-0.18	6.1-8.4	0-2	Low-------	0.28			
	24-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
RsB, RsC:												
Renshaw---------	0-8	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
Sioux-----------	0-8	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	8-13	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	13-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
SnA-------------- Sinai	0-8	40-60	1.15-1.30	0.06-0.2	0.13-0.16	6.1-7.3	0-2	High------	0.28	5	4	3-7
	8-23	45-60	1.20-1.40	0.06-0.2	0.17-0.19	6.6-7.8	0-2	Very high	0.37			
	23-38	45-60	1.20-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	Very high	0.37			
	38-60	30-50	1.35-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	High------	0.43			
SrD:												
Sioux-----------	0-8	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	8-13	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	13-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Renshaw---------	0-8	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
Ss--------------- Southam	0-12	27-40	1.10-1.40	0.2-0.6	0.18-0.23	6.6-8.4	2-8	Moderate	0.37	5	4L	5-20
	12-25	35-50	1.20-1.50	0.06-0.2	0.14-0.20	6.6-8.4	2-8	High------	0.28			
	25-60	18-50	1.20-1.50	0.06-0.6	0.13-0.17	7.4-8.4	2-8	High------	0.28			
St:												
Stickney--------	0-11	20-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-------	0.37	5	6	2-4
	11-20	35-45	1.20-1.35	0.06-0.2	0.16-0.19	6.1-7.8	4-16	High------	0.37			
	20-60	20-35	1.50-1.70	0.06-0.6	0.14-0.18	7.4-9.0	4-16	Moderate	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
St:												
Dudley----------	0-9	18-25	1.00-1.20	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	9-21	35-50	1.35-1.45	0.01-0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32			
	21-36	30-50	1.40-1.50	0.06-0.2	0.13-0.19	7.4-9.0	8-16	High------	0.32			
	36-60	20-35	1.55-1.65	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.37			
Sv:												
Stickney--------	0-11	20-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-------	0.37	5	6	2-4
	11-20	35-45	1.20-1.35	0.06-0.2	0.16-0.19	6.1-7.8	4-16	High------	0.37			
	20-60	20-35	1.50-1.70	0.06-0.6	0.14-0.18	7.4-9.0	4-16	Moderate	0.37			
Dudley----------	0-9	18-25	1.00-1.20	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	9-21	35-50	1.35-1.45	0.01-0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32			
	21-36	30-50	1.40-1.50	0.06-0.2	0.13-0.19	7.4-9.0	8-16	High------	0.32			
	36-60	20-35	1.55-1.65	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.37			
Hoven-----------	0-2	22-26	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-------	0.37	2	6	2-4
	2-5	35-60	1.15-1.30	0.01-0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37			
	5-34	35-60	1.15-1.30	0.01-0.06	0.10-0.19	6.6-8.4	4-16	High------	0.37			
	34-60	35-60	1.30-1.50	0.01-0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37			
TdD:												
Talmo-----------	0-7	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.6-7.8	0-0	Low-------	0.28	2	6	2-4
	7-60	0-10	1.45-1.65	6.0-20	0.03-0.06	7.4-8.4	0-0	Low-------	0.05			
Delmont---------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	9-18	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	18-60	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Te--------------- Tetonka	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	6	4-8
	10-21	25-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	21-48	35-60	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High------	0.28			
	48-60	30-50	1.35-1.50	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
To--------------- Tonka	0-19	27-39	1.10-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Moderate	0.37	5	7	5-10
	19-51	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High------	0.43			
	51-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
VbA, VbB:												
Vienna----------	0-8	22-26	1.10-1.25	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low-------	0.28	5	6	3-8
	8-16	24-32	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	16-32	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	32-60	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Brookings-------	0-17	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Moderate	0.28	5	7	4-8
	17-25	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	25-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32			
	39-60	20-35	1.50-1.70	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Wa--------------- Waubay	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-42	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
Wb:												
Waubay----------	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-42	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Wb:												
Badger----------	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	9-35	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	35-55	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
	55-60	20-35	1.50-1.70	0.06-0.2	0.14-0.20	7.4-8.4	0-4	Moderate	0.37			
Wo--------------- Worthing	0-10	35-40	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	High------	0.37	5	4	3-5
	10-45	40-60	1.25-1.40	0.06-0.2	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	45-60	30-50	1.35-1.50	0.2-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
Wp--------------- Worthing	0-10	30-40	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	High------	0.37	5	8	3-5
	10-45	40-60	1.20-1.35	0.06-0.2	0.13-0.18	6.1-7.8	0-2	High------	0.28			
	45-60	30-50	1.35-1.50	0.2-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Ba----------------- Badger	C	Frequent----	Brief-----	Mar-Oct	0-3.0	Perched	Oct-Jun	High-----	High-----	Low.
Bb----------------- Baltic	D	Frequent----	Very brief or brief.	Mar-Sep	0-1.5	Apparent	Jan-Dec	High-----	High-----	Moderate.
BcB, BcC: Barnes-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
Buse--------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
BdA, BdB, BdC----- Beadle	C	None--------	---	---	>6.0	---	---	Low------	High-----	Moderate.
BeA: Beadle-----------	C	None--------	---	---	>6.0	---	---	Low------	High-----	Moderate.
Dudley-----------	D	None--------	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High-----	High.
Bn----------------- Bon	B	Rare--------	---	---	3.0-5.0	Apparent	Oct-Jul	Moderate	Moderate	Low.
Bo----------------- Bon	B	Frequent----	Brief-----	Apr-Oct	3.0-5.0	Apparent	Oct-Jul	High-----	Moderate	Low.
BrB---------------- Brandt	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
BuC, BuD: Buse--------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Barnes-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
BxD: Buse--------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Holmquist--------	D	Frequent----	Brief-----	Mar-Jun	0.5-1.5	Apparent	Oct-Jun	Moderate	High-----	Moderate.
CbA, CbB: Clarno-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Bonilla----------	B	None--------	---	---	3.5-5.0	Perched	Mar-Jun	Moderate	High-----	Moderate.
CeB: Clarno-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Ethan------------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Bonilla----------	B	None--------	---	---	3.5-5.0	Perched	Mar-Jun	Moderate	High-----	Moderate.
CeC: Clarno-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Ethan------------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Bonilla----------	B	None--------	---	---	3.5-5.0	Perched	Apr-Jun	Moderate	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
Ct:										
Crossplain-------	C	Frequent----	Brief-----	Mar-Oct	0-2.0	Perched	Mar-Jun	High-----	High-----	Moderate.
Tetonka----------	C/D	None--------	---	---	+1-1.0	Perched	Jan-Dec	High-----	High-----	Moderate.
Cu---------------- Cubden	C	None--------	---	---	1.5-3.5	Apparent	Apr-Jun	High-----	High-----	Low.
Cv:										
Cubden-----------	C	None--------	---	---	1.5-3.5	Apparent	Apr-Jun	High-----	High-----	Low.
Badger-----------	C	Frequent----	Brief-----	Mar-Oct	0-3.0	Perched	Oct-Jun	High-----	High-----	Low.
Cw:										
Cubden-----------	C	None--------	---	---	1.5-3.5	Apparent	Apr-Jun	High-----	High-----	Low.
Tonka------------	C/D	None--------	---	---	+.5-1.0	Apparent	Apr-Jun	High-----	High-----	Low.
Dc:										
Davison----------	B	None--------	---	---	1.5-4.0	Perched	Apr-Jun	High-----	High-----	Moderate.
Crossplain-------	C	Frequent----	Brief-----	Mar-Oct	0-2.0	Perched	Mar-Jun	High-----	High-----	Moderate.
DeA--------------- Delmont	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
DtB:										
Delmont----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Talmo------------	A	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Dv---------------- Divide	B	None--------	---	---	1.5-3.5	Apparent	Apr-Jun	Moderate	High-----	Low.
Dx:										
Dudley-----------	D	None--------	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High-----	High.
Jerauld----------	D	None--------	---	---	3.5-5.0	Perched	Apr-Jun	Low------	High-----	Moderate.
Dy---------------- Durrstein	D	Frequent----	Brief-----	Apr-Oct	0-1.5	Apparent	Oct-Jun	Moderate	High-----	High.
EgA, EgB:										
Egeland----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Embden-----------	B	None--------	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High-----	Low.
EmC:										
Egeland----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Maddock----------	A	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
EnD:										
Ethan------------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Betts------------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
EoD:										
Ethan------------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Bon--------------	B	Frequent----	Brief-----	Apr-Oct	3.0-5.0	Apparent	Oct-Jul	High-----	Moderate	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
EtC, EtD:										
Ethan	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Clarno	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
HbB:										
Henkin	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Blendon	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
HeA, HeB: Hetland	C	None	---	---	>6.0	---	---	Moderate	High	Moderate.
HpA, HpB:										
Houdek	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Prosper	B	None	---	---	3.5-5.0	Perched	Mar-Jun	High	High	Moderate.
HsA, HsB:										
Houdek	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Stickney	C	None	---	---	3.5-5.0	Apparent	Mar-Jun	Moderate	High	High.
Ht:										
Houdek	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Stickney	C	None	---	---	3.5-5.0	Apparent	Mar-Jun	Moderate	High	High.
Tetonka	C/D	None	---	---	+1-1.0	Perched	Jan-Dec	High	High	Moderate.
Hv: Hoven	D	None	---	---	+1-1.5	Perched	Mar-Jul	Moderate	High	Moderate.
Lh:										
La Prairie	B	Occasional	Brief	Mar-Jun	3.5-5.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Holmquist	D	Frequent	Brief	Mar-Jun	0.5-1.5	Apparent	Oct-Jun	Moderate	High	Moderate.
Lm: Lamoure	C	Occasional	Brief	Mar-Jun	0-2.0	Apparent	Oct-Jun	High	High	Moderate.
Lo: Lowe	B/D	Occasional	Brief	Mar-Nov	0-1.5	Apparent	Jan-Dec	High	High	Low.
Ma: Marysland	B/D	Occasional	Brief	Apr-Sep	0.5-1.5	Apparent	Nov-Jul	High	High	Low.
MeA: Minnewasta	D	None	---	---	0.-3.5	Apparent	Nov-Jun	High	High	Low.
Mw: Minnewaukan	A/D	Occasional	Long	Apr-Jun	+.5-1.5	Apparent	Mar-Jul	Moderate	High	Low.
Od: Oldham	C/D	None	---	---	0.5-1.5	Apparent	Oct-Jun	High	Moderate	High.
Og: Orthents	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Pa: Parnell	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec	High	High	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
Pm----------------- Playmoor	C/D	Frequent----	Brief-----	Mar-Jun	0-1.5	Apparent	Sep-Jun	High-----	High-----	High.
PoB, PoC:										
Poinsett---------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Waubay-----------	B	None--------	---	---	3.5-5.0	Apparent	Oct-Jun	High-----	High-----	Low.
PrB:										
Poinsett---------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.
Rusklyn----------	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
Waubay-----------	B	None--------	---	---	3.5-5.0	Apparent	Oct-Jun	High-----	High-----	Low.
PwA, PwB:										
Poinsett---------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.
Waubay-----------	B	None--------	---	---	3.5-5.0	Apparent	Oct-Jun	High-----	High-----	Low.
RfA, RfB:										
Renshaw----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Fordville--------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
RsB, RsC:										
Renshaw----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Sioux------------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
SnA--------------- Sinai	C	None--------	---	---	>6.0	---	---	Low------	High-----	High.
SrD:										
Sioux------------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
Renshaw----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Ss---------------- Southam	D	None--------	---	---	+5-1.0	Apparent	Jan-Dec	High-----	High-----	Low.
St:										
Stickney---------	C	None--------	---	---	3.5-5.0	Apparent	Mar-Jun	Moderate	High-----	High.
Dudley-----------	D	None--------	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High-----	High.
Sv:										
Stickney---------	C	None--------	---	---	3.5-5.0	Apparent	Mar-Jun	Moderate	High-----	High.
Dudley-----------	D	None--------	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High-----	High.
Hoven------------	D	None--------	---	---	+1-1.5	Perched	Mar-Jul	Moderate	High-----	Moderate.
TdD:										
Talmo------------	A	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Delmont----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Te---------------- Tetonka	C/D	None--------	---	---	+1-1.0	Perched	Jan-Dec	High-----	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
To----------------- Tonka	C/D	None---------	---	---	+.5-1.0	Apparent	Apr-Jun	High-----	High-----	Low.
VbA, VbB:										
Vienna------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Brookings---------	B	None---------	---	---	3.0-5.0	Perched	Oct-Jul	High-----	High-----	Moderate.
Wa----------------- Waubay	B	None---------	---	---	3.5-5.0	Apparent	Oct-Jun	High-----	High-----	Low.
Wb:										
Waubay------------	B	None---------	---	---	3.5-5.0	Apparent	Oct-Jun	High-----	High-----	Low.
Badger------------	C	Frequent----	Brief-----	Mar-Oct	0-3.0	Perched	Oct-Jun	High-----	High-----	Low.
Wo----------------- Worthing	D	None---------	---	---	+2-1.0	Perched	Jan-Dec	High-----	High-----	Moderate.
Wp----------------- Worthing	D	None---------	---	---	+3-0.5	Perched	Jan-Dec	High-----	High-----	High.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Badger	Fine, montmorillonitic, frigid Typic Argiaquolls
Baltic	Fine, montmorillonitic (calcareous), mesic Cumulic Vertic Endoaquolls
Barnes	Fine-loamy, mixed Udic Haploborolls
Beadle	Fine, montmorillonitic, mesic Typic Argiustolls
Betts	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Bon	Fine-loamy, mixed, mesic Cumulic Haplustolls
Bonilla	Fine-loamy, mixed, mesic Pachic Haplustolls
Brandt	Fine-silty, mixed Udic Haploborolls
Brookings	Fine-silty, mixed Pachic Udic Haploborolls
Buse	Fine-loamy, mixed Udic Calciborolls
Clarno	Fine-loamy, mixed, mesic Typic Haplustolls
Crossplain	Fine, montmorillonitic, mesic Vertic Argiaquolls
Cubden	Fine-silty, frigid Aeric Calciaquolls
Davison	Fine-loamy, mixed, mesic Aquic Calciustolls
Delmont	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Divide	Fine-loamy over sandy or sandy-skeletal, frigid Aeric Calciaquolls
Dudley	Fine, montmorillonitic, mesic Typic Natrustolls
Durrstein	Fine, montmorillonitic, mesic Typic Natraquolls
Egeland	Coarse-loamy, mixed Udic Haploborolls
Embden	Coarse-loamy, mixed Pachic Udic Haploborolls
Ethan	Fine-loamy, mixed, mesic Typic Calciustolls
Fordville	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Henkin	Coarse-loamy, mixed, mesic Udic Haplustolls
Hetland	Fine, montmorillonitic Vertic Argiborolls
Holmquist	Coarse-loamy, mixed (calcareous), frigid Mollic Fluvaquents
Houdek	Fine-loamy, mixed, mesic Typic Argiustolls
Hoven	Fine, montmorillonitic, mesic Vertic Natraquolls
Jerauld	Fine, montmorillonitic, mesic Leptic Natrustolls
Lamoure	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
La Prairie	Fine-loamy, mixed Cumulic Udic Haploborolls
Lowe	Fine-loamy, frigid Typic Calciaquolls
Maddock	Sandy, mixed Udorthentic Haploborolls
Marysland	Fine-loamy over sandy or sandy-skeletal, frigid Typic Calciaquolls
Minnewasta	Sandy over loamy, mixed (calcareous), frigid Aeric Endoaquents
Minnewaukan	Mixed, frigid Typic Psammaquents
Oldham	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Epiaquolls
Orthents	Orthents
Parnell	Fine, montmorillonitic, frigid Vertic Argiaquolls
Playmoor	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
Poinsett	Fine-silty, mixed Udic Haploborolls
Prosper	Fine-loamy, mixed, mesic Pachic Argiustolls
Renshaw	Fine-loamy over sandy or sandy-skeletal, mixed Udic Haploborolls
Rusklyn	Fine-silty, mixed Udic Calciborolls
Sinai	Fine, montmorillonitic, frigid Typic Hapluderts
Sioux	Sandy-skeletal, mixed Udorthentic Haploborolls
Southam	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Endoaquolls
Stickney	Fine, montmorillonitic, mesic Glossic Natrustolls
Talmo	Sandy-skeletal, mixed, mesic Udorthentic Haplustolls
Tetonka	Fine, montmorillonitic, mesic Argiaquic Argialbolls
Tonka	Fine, montmorillonitic, frigid Argiaquic Argialbolls
Vienna	Fine-loamy, mixed Udic Haploborolls
Waubay	Fine-silty, mixed Pachic Udic Haploborolls
Worthing	Fine, montmorillonitic, mesic Vertic Argiaquolls

Interpretive Groups

INTERPRETIVE GROUPS

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Ba	Badger------------	Eastern	IIw-1	Loamy Overflow-----	2	A
Bb	Baltic------------	East Central	Vw-4	Wetland------------	10	B1
BcB	Barnes------------	Eastern	IIe-2	Silty--------------	3	F
	Buse--------------	Eastern	IIIe-6	Thin Upland--------	8	G
BcC	Barnes------------	Eastern	IIIe-1	Silty--------------	3	F
	Buse--------------	Eastern	IVe-2	Thin Upland--------	8	G
BdA	Beadle------------	East Central	IIs-1	Clayey-------------	4	E
BdB	Beadle------------	East Central	IIIe-3	Clayey-------------	4	E
BdC	Beadle------------	East Central	IVe-7	Clayey-------------	4	E
BeA	Beadle------------	East Central	IIs-1	Clayey-------------	4	E
	Dudley------------	East Central	IVs-2	Claypan------------	9	C
Bn	Bon---------------	East Central	IIc-1	Loamy Overflow-----	1	K
Bo	Bon---------------	East Central	VIw-1	Loamy Overflow-----	1	NS
BrB	Brandt------------	Eastern	IIe-3	Silty--------------	3	F
BuC	Buse--------------	Eastern	IVe-2	Thin Upland--------	8	G
	Barnes------------	Eastern	IIIe-1	Silty--------------	3	F
BuD	Buse--------------	Eastern	VIe-3	Thin Upland--------	10	NS
	Barnes------------	Eastern	IVe-1	Silty--------------	3	F
BxD	Buse--------------	Eastern	VIe-3	Thin Upland--------	8	G
	Holmquist---------	Eastern	VIw-1	Saline Subirrigated	10	NS
CbA	Clarno------------	East Central	IIc-2	Silty--------------	3	F
	Bonilla-----------	East Central	IIc-3	Loamy Overflow-----	1	K
CbB	Clarno------------	East Central	IIe-2	Silty--------------	3	F
	Bonilla-----------	East Central	IIc-3	Loamy Overflow-----	1	K
CeB	Clarno------------	East Central	IIe-2	Silty--------------	3	F
	Ethan-------------	East Central	IIIe-12	Thin Upland--------	8	G
	Bonilla-----------	East Central	IIc-3	Loamy Overflow-----	1	K
CeC	Clarno------------	East Central	IIIe-2	Silty--------------	3	F
	Ethan-------------	East Central	IVe-3	Thin Upland--------	8	G
	Bonilla-----------	East Central	IIe-3	Silty--------------	1	K
Ct	Crossplain--------	East Central	IIw-1	Loamy Overflow-----	2	A
	Tetonka-----------	East Central	IVw-1	Wet Meadow---------	10	B2

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Cu	Cubden------------	Eastern	IIs-4	Limy Subirrigated--	1	F
Cv	Cubden------------	Eastern	IIs-4	Limy Subirrigated--	1	F
	Badger------------	Eastern	IIw-1	Loamy Overflow-----	2	A
Cw	Cubden------------	Eastern	IIs-4	Limy Subirrigated--	1	F
	Tonka-------------	Eastern	IVw-2	Wet Meadow---------	10	B2
Dc	Davison-----------	East Central	IIe-4	Limy Subirrigated--	1	F
	Crossplain--------	East Central	IIw-1	Loamy Overflow-----	2	A
DeA	Delmont-----------	East Central	IVs-1	Shallow to Gravel--	6	D2
DtB	Delmont-----------	East Central	IVe-6	Shallow to Gravel--	6	D2
	Talmo-------------	East Central	VIs-4	Very Shallow-------	10	NS
Dv	Divide------------	Eastern	IIIs-4	Limy Subirrigated--	1	D1
Dx	Dudley------------	East Central	IVs-2	Claypan------------	9	C
	Jerauld-----------	East Central	VIs-1	Thin Claypan-------	10	NS
Dy	Durrstein---------	East Central	VIs-6	Saline Lowland-----	10	J
EgA	Egeland-----------	Eastern	IIIs-1	Sandy--------------	5	H
	Embden------------	Eastern	IIs-5	Sandy--------------	1	H
EgB	Egeland-----------	Eastern	IIIe-7	Sandy--------------	5	H
	Embden------------	Eastern	IIIe-7	Sandy--------------	1	H
EmC	Egeland-----------	Eastern	IVe-3	Sandy--------------	5	H
	Maddock-----------	Eastern	IVe-3	Sandy--------------	5	H
EnD	Ethan-------------	East Central	VIe-3	Thin Upland--------	8	G
	Betts-------------	East Central	VIe-3	Thin Upland--------	8	G
EoD	Ethan-------------	East Central	VIe-3	Thin Upland--------	8	G
	Bon---------------	East Central	VIw-1	Loamy Overflow-----	1	NS
EtC	Ethan-------------	East Central	IVe-3	Thin Upland--------	8	G
	Clarno------------	East Central	IIIe-2	Silty--------------	3	F
EtD	Ethan-------------	East Central	VIe-3	Thin Upland--------	8	G
	Clarno------------	East Central	IVe-1	Silty--------------	3	F
HbB	Henkin------------	East Central	IIIe-8	Sandy--------------	5	H
	Blendon-----------	East Central	IIIe-8	Sandy--------------	5	H
HeA	Hetland-----------	Eastern	I-2	Silty--------------	4	F
HeB	Hetland-----------	Eastern	IIe-3	Silty--------------	4	F

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
HpA	Houdek------------	East Central	IIc-2	Silty---------------	3	F
	Prosper-----------	East Central	IIc-3	Loamy Overflow-----	1	K
HpB	Houdek------------	East Central	IIe-2	Silty---------------	3	F
	Prosper-----------	East Central	IIc-3	Loamy Overflow-----	1	K
HsA	Houdek------------	East Central	IIc-2	Silty---------------	3	F
	Stickney----------	East Central	IIIs-1	Clayey-------------	4	E
HsB	Houdek------------	East Central	IIe-2	Silty---------------	3	F
	Stickney----------	East Central	IIIe-15	Clayey-------------	4	E
Ht	Houdek------------	East Central	IIc-2	Silty---------------	3	F
	Stickney----------	East Central	IIIs-1	Clayey-------------	4	E
	Tetonka-----------	East Central	IVw-1	Wet Meadow---------	10	B2
Hv	Hoven-------------	East Central	VIs-6	Closed Depression--	10	B2
Lh	La Prairie--------	Eastern	VIw-1	Loamy Overflow-----	1	NS
	Holmquist---------	Eastern	VIw-1	Saline Subirrigated	10	NS
Lm	Lamoure-----------	Eastern	IIIw-2	Subirrigated-------	2	A
Lo	Lowe--------------	Eastern	IVw-3	Subirrigated-------	10	A
Ma	Marysland---------	Eastern	IVw-3	Subirrigated-------	10	B1
MeA	Minnewasta--------	Eastern	IVw-1	Subirrigated-------	10	A
Mw	Minnewaukan-------	Eastern	IVw-1	Subirrigated-------	2	A
Od	Oldham------------	Eastern	Vw-2	Wetland------------	10	B2
Og	Orthents----------	Eastern	VIIIs-1	Very Shallow-------	10	NS
Pa	Parnell-----------	Eastern	Vw-2	Shallow Marsh------	10	B2
Pm	Playmoor----------	Eastern	IVw-4	Saline Subirrigated	10	J
PoB	Poinsett----------	Eastern	IIe-3	Silty---------------	3	F
	Buse--------------	Eastern	IIIe-6	Thin Upland--------	8	G
	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K
PoC	Poinsett----------	Eastern	IIIe-2	Silty---------------	3	F
	Buse--------------	Eastern	IVe-2	Thin Upland--------	8	G
	Waubay------------	Eastern	IIe-1	Silty---------------	1	K
PrB	Poinsett----------	Eastern	IIe-3	Silty---------------	3	F
	Rusklyn-----------	Eastern	IIIe-6	Thin Upland--------	8	G
	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
PwA	Poinsett----------	Eastern	I-2	Silty--------------	3	F
	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K
PwB	Poinsett----------	Eastern	IIe-3	Silty--------------	3	F
	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K
RfA	Renshaw-----------	Eastern	IIIs-3	Shallow to Gravel--	6	D2
	Fordville---------	Eastern	IIs-3	Silty--------------	6	D1
RfB	Renshaw-----------	Eastern	IVs-2	Shallow to Gravel--	6	D2
	Fordville---------	Eastern	IIe-5	Silty--------------	6	D1
RsB	Renshaw-----------	Eastern	IVs-2	Shallow to Gravel--	6	D2
	Sioux-------------	Eastern	VIs-3	Very Shallow-------	10	NS
RsC	Renshaw-----------	Eastern	IVe-4	Shallow to Gravel--	6	D2
	Sioux-------------	Eastern	VIs-3	Very Shallow-------	10	NS
SnA	Sinai-------------	Eastern	IIs-2	Clayey-------------	4	I
SrD	Sioux-------------	Eastern	VIs-3	Very Shallow-------	10	NS
	Renshaw-----------	Eastern	VIe-6	Shallow to Gravel--	10	NS
Ss	Southam-----------	Eastern	VIIIw-1	Not assigned-------	10	NS
St	Stickney----------	East Central	IIIs-1	Clayey-------------	4	E
	Dudley------------	East Central	IVs-2	Claypan------------	9	C
Sv	Stickney----------	East Central	IIIs-1	Clayey-------------	4	E
	Dudley------------	East Central	IVs-2	Claypan------------	9	C
	Hoven-------------	East Central	VIs-6	Closed Depression--	10	B2
TdD	Talmo-------------	East Central	VIs-4	Very Shallow-------	10	NS
	Delmont-----------	East Central	VIe-5	Shallow to Gravel--	6	NS
Te	Tetonka-----------	East Central	IVw-1	Wet Meadow---------	10	B2
To	Tonka-------------	Eastern	IVw-2	Wet Meadow---------	10	B2
VbA	Vienna------------	Eastern	I-2	Silty--------------	3	F
	Brookings---------	Eastern	I-3	Loamy Overflow-----	1	K
VbB	Vienna------------	Eastern	IIe-2	Silty--------------	3	F
	Brookings---------	Eastern	I-3	Loamy Overflow-----	1	K
Wa	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K
Wb	Waubay------------	Eastern	I-3	Loamy Overflow-----	1	K
	Badger------------	Eastern	IIw-1	Loamy Overflow-----	2	A

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Wo	Worthing----------	East Central	Vw-4	Shallow Marsh------	10	B2
Wp	Worthing----------	East Central	VIIIw-1	Not assigned-------	10	NS

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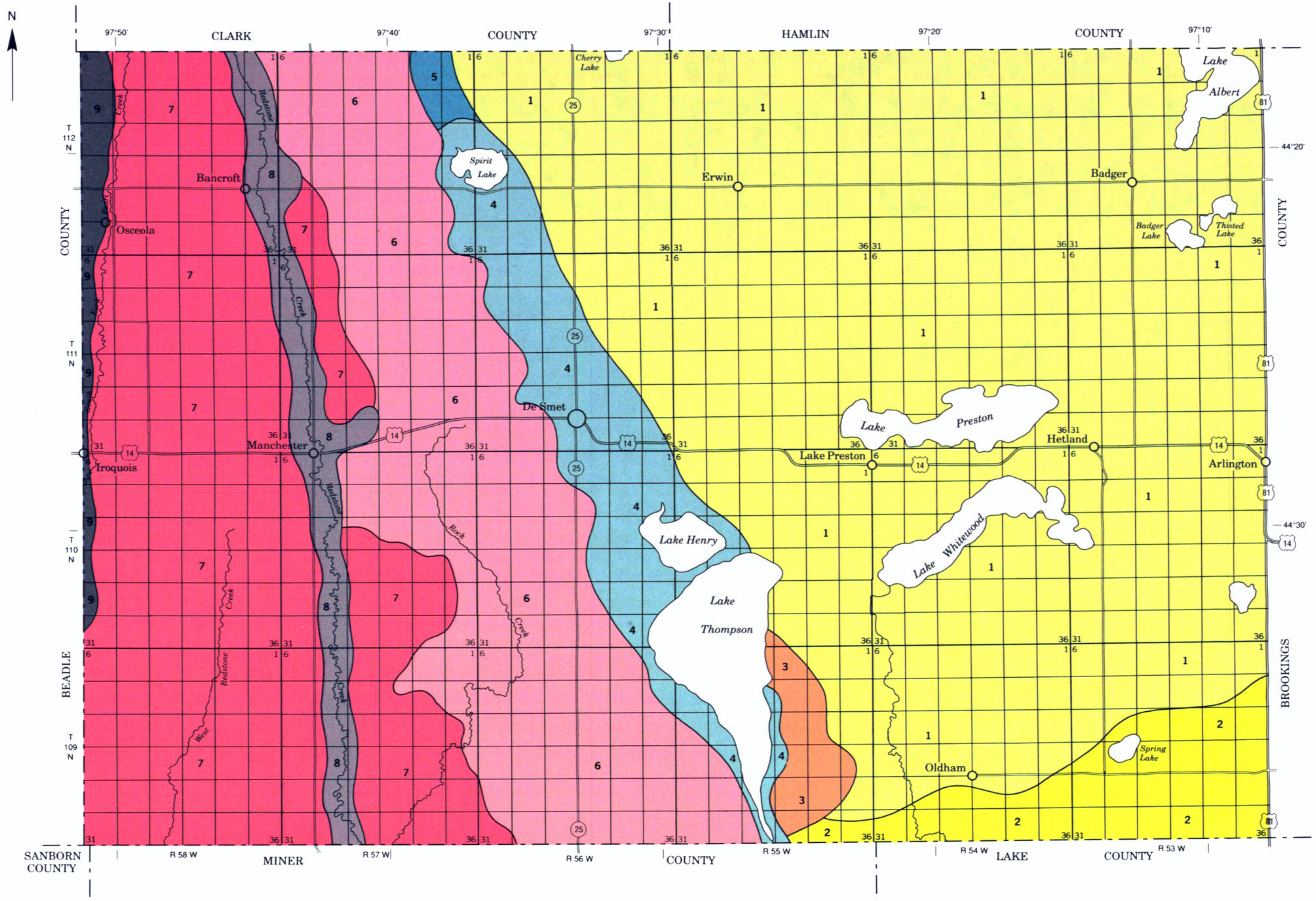


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SOIL LEGEND*

DOMINANTLY NEARLY LEVEL TO GENTLY ROLLING SOILS THAT ARE WELL DRAINED AND MODERATELY WELL DRAINED

- 1 Poinsett-Waubay-Buse association
- 2 Poinsett-Hetland association
- 3 Vienna-Egeland association

DOMINANTLY NEARLY LEVEL TO STRONGLY SLOPING SOILS THAT ARE EXCESSIVELY DRAINED TO POORLY DRAINED

- 4 Renshaw-Sioux-Marysland association
- 5 Renshaw-Fordville association

DOMINANTLY NEARLY LEVEL TO MODERATELY STEEP SOILS THAT ARE WELL DRAINED AND MODERATELY WELL DRAINED

- 6 Clarno-Bonilla-Ethan association
- 7 Houdek-Stickney-Dudley association
- 8 Clarno-Bon association
- 9 Beadle-Dudley association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1991

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

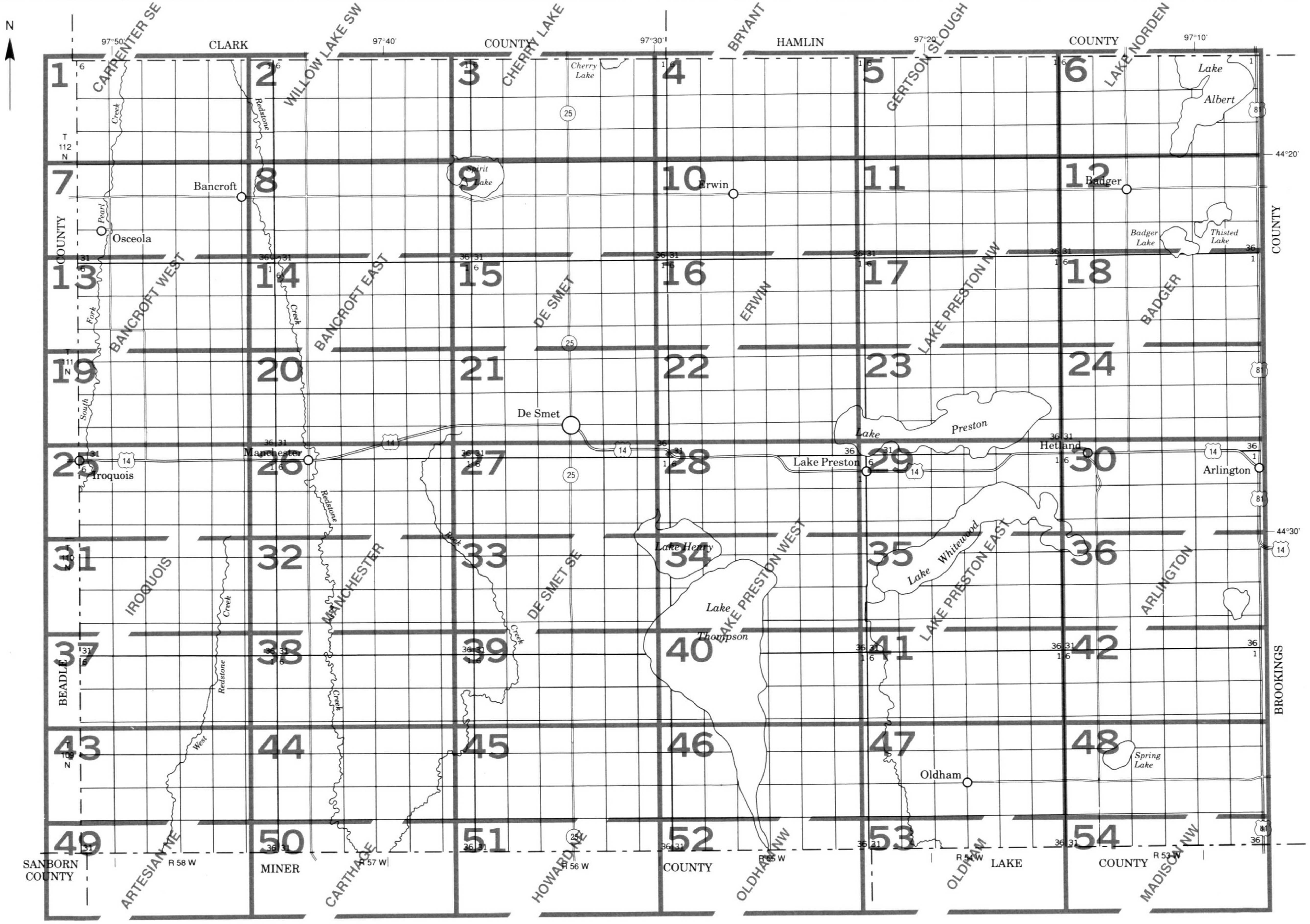
GENERAL SOIL MAP
KINGSBURY COUNTY, SOUTH DAKOTA

Scale 1:190,080

1 0 1 2 3 Mi

1 0 3 6 Km

Original text from each individual map sheet read:
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
KINGSBURY COUNTY, SOUTH DAKOTA

Scale 1:190,080

1 0 1 2 3 Mi

1 0 3 6 Km

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping phases. The second capital letter indicates the slope class. Symbols without a slope letter are for level or nearly level soils or for map units classified at higher taxonomic levels.

SYMBOL	NAME
Ba	Badger silty clay loam
Bb	Baltic silty clay loam
BcB	Barnes-Buse loams, 2 to 6 percent slopes
BcC	Barnes-Buse loams, 6 to 9 percent slopes
BdA	Beadle loam, 0 to 2 percent slopes
BdB	Beadle loam, 2 to 6 percent slopes
BdC	Beadle loam, 6 to 9 percent slopes
BeA	Beadle-Dudley complex, 0 to 2 percent slopes
Bn	Bon loam
Bo	Bon loam, channeled
BrB	Brandt silty clay loam, 2 to 6 percent slopes
BuC	Buse-Barnes loams, 6 to 9 percent slopes
BuD	Buse-Barnes loams, 9 to 20 percent slopes
BxD	Buse-Holmquist, channeled, loams, 0 to 20 percent slopes
CbA	Clarno-Bonilla loams, 0 to 2 percent slopes
CbB	Clarno-Bonilla loams, 1 to 6 percent slopes
CeB	Clarno-Ethan-Bonilla loams, 1 to 6 percent slopes
CeC	Clarno-Ethan-Bonilla loams, 2 to 9 percent slopes
Ct	Crossplain-Tetonka complex
Cu	Cubden silty clay loam
Cv	Cubden-Badger silty clay loams
Cw	Cubden-Tonka silty clay loams
Dc	Davison-Crossplain complex
DeA	Delmont loam, 0 to 2 percent slopes
DtB	Delmont-Talmo loams, 2 to 6 percent slopes
Dv	Divide loam
Dx	Dudley-Jerauld silt loams
Dy	Durrstein silt loam
EgA	Egeland-Embden complex, 0 to 2 percent slopes
EgB	Egeland-Embden complex, 2 to 6 percent slopes
EmC	Egeland-Maddock sandy loams, 6 to 9 percent slopes
EnD	Ethan-Betts loams, 9 to 20 percent slopes
EoD	Ethan-Bon, channeled, loams, 0 to 20 percent slopes
EtC	Ethan-Clarno loams, 6 to 9 percent slopes
EtD	Ethan-Clarno loams, 9 to 15 percent slopes
HbB	Henkin-Blendon fine sandy loams, 2 to 6 percent slopes
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
HpA	Houdek-Prosper loams, 0 to 2 percent slopes
HpB	Houdek-Prosper loams, 1 to 6 percent slopes
HsA	Houdek-Stickney complex, 0 to 2 percent slopes
HsB	Houdek-Stickney complex, 2 to 6 percent slopes
Ht	Houdek-Stickney-Tetonka complex
Hv	Hoven silt loam
Lh	La Prairie-Holmquist loams, channeled
Lm	Lamoure silty clay loam
Lo	Lowe loam
Ma	Marysland loam
MeA	Minnewasta sandy loam, 0 to 2 percent slopes
Mw	Minnewaukan loamy sand
Od	Oldham silty clay loam
Og	Orthents, gravelly
Pa	Parnell silty clay loam
Pm	Playmoor silty clay loam
PoB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PoC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes
PrB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
RfA	Renshaw-Fordville loams, 0 to 2 percent slopes
RfB	Renshaw-Fordville loams, 2 to 6 percent slopes
RsB	Renshaw-Sioux complex, 2 to 6 percent slopes
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes
SnA	Sinai silty clay, 0 to 2 percent slopes
SrD	Sioux-Renshaw complex, 9 to 15 percent slopes
Ss	Southam silty clay loam
St	Stickney-Dudley silt loams
Sv	Stickney-Dudley-Hoven silt loams
TdD	Talmo-Delmont loams, 6 to 15 percent slopes
Te	Tetonka silt loam
To	Tonka silty clay loam
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
Wa	Waubay silty clay loam
Wb	Waubay-Badger silty clay loams
Wo	Worthing silty clay loam
Wp	Worthing silty clay loam, ponded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 173
- Federal — 287
- State — 52
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (< 3 acres)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label)
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot (< 4 acres)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — Ba EgA

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

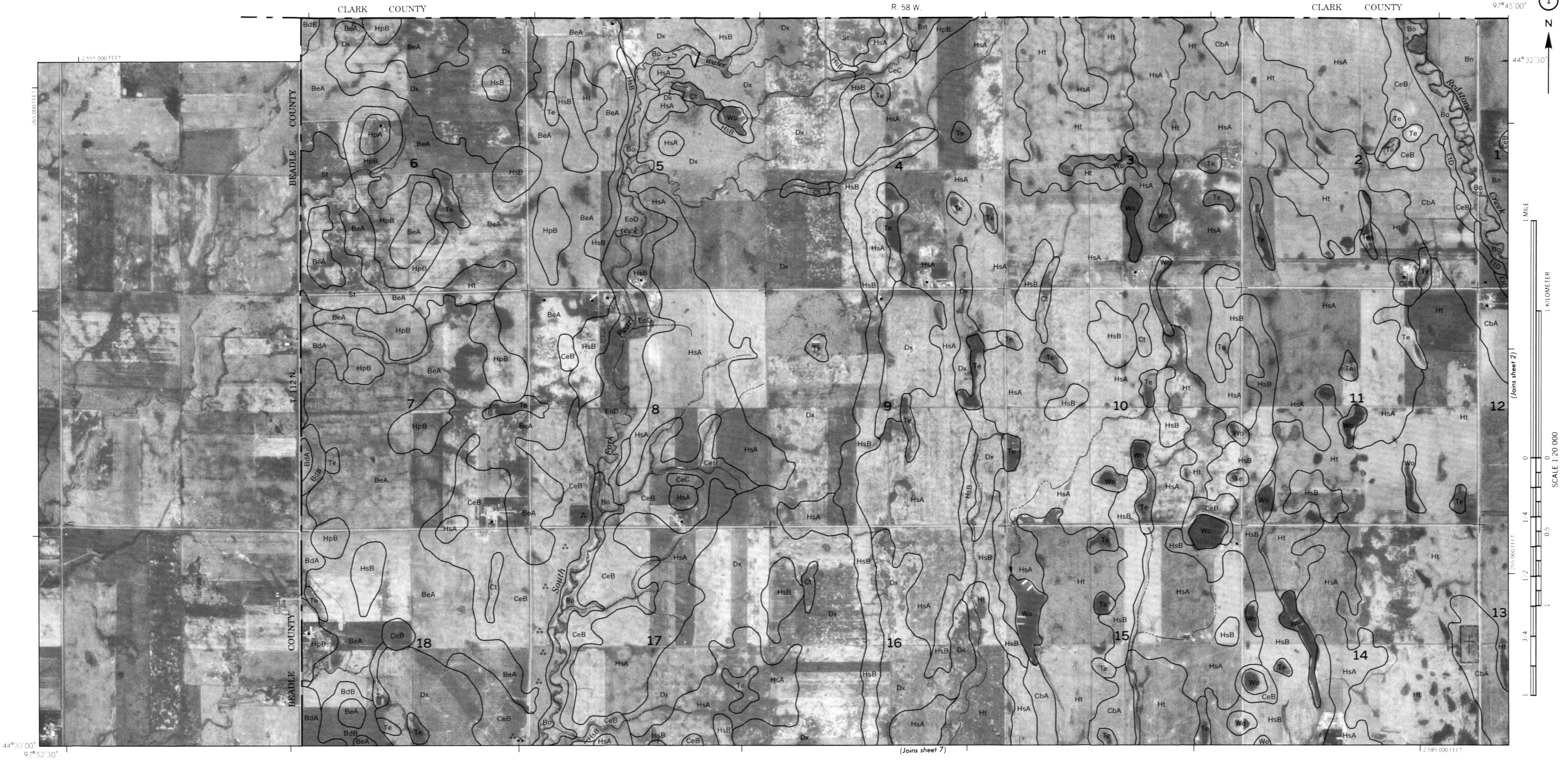
GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

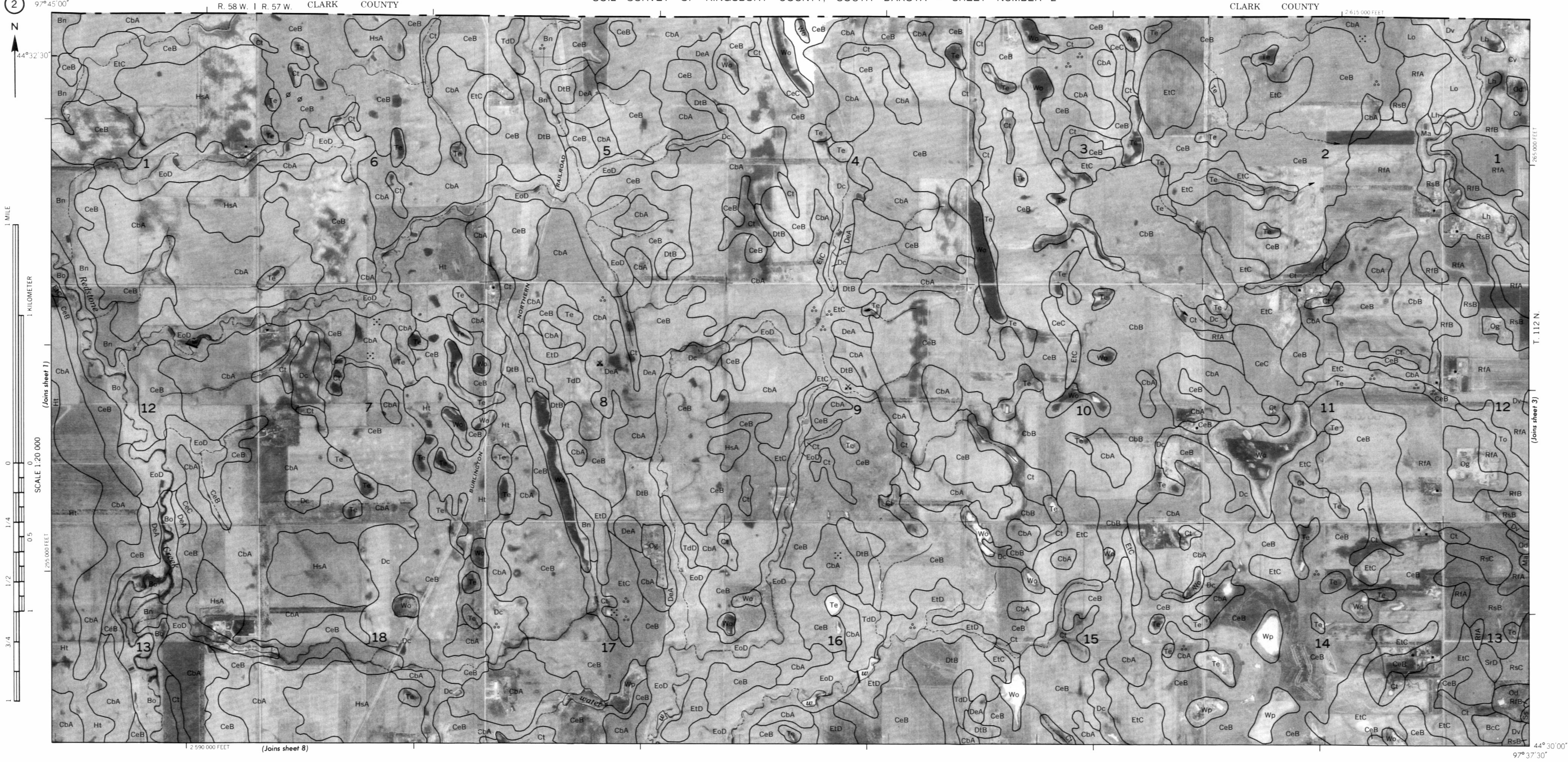
MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot (< 4 acres)
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot (< 4 acres)
- Sandy spot (< 4 acres)
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot (< 4 acres)



CLARK COUNTY
R. 58 W.
CLARK COUNTY
97°45'00"
1
N
44°32'30"
2 555 000 FEET
265 000 FEET
BEADLE COUNTY
T. 112 N.
BEADLE COUNTY
Redstone Creek
Pearl Creek
South Fork
water
(Joins sheet 2)
(Joins sheet 7)
44°30'00"
97°52'30"
2 585 000 FEET
250 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 2



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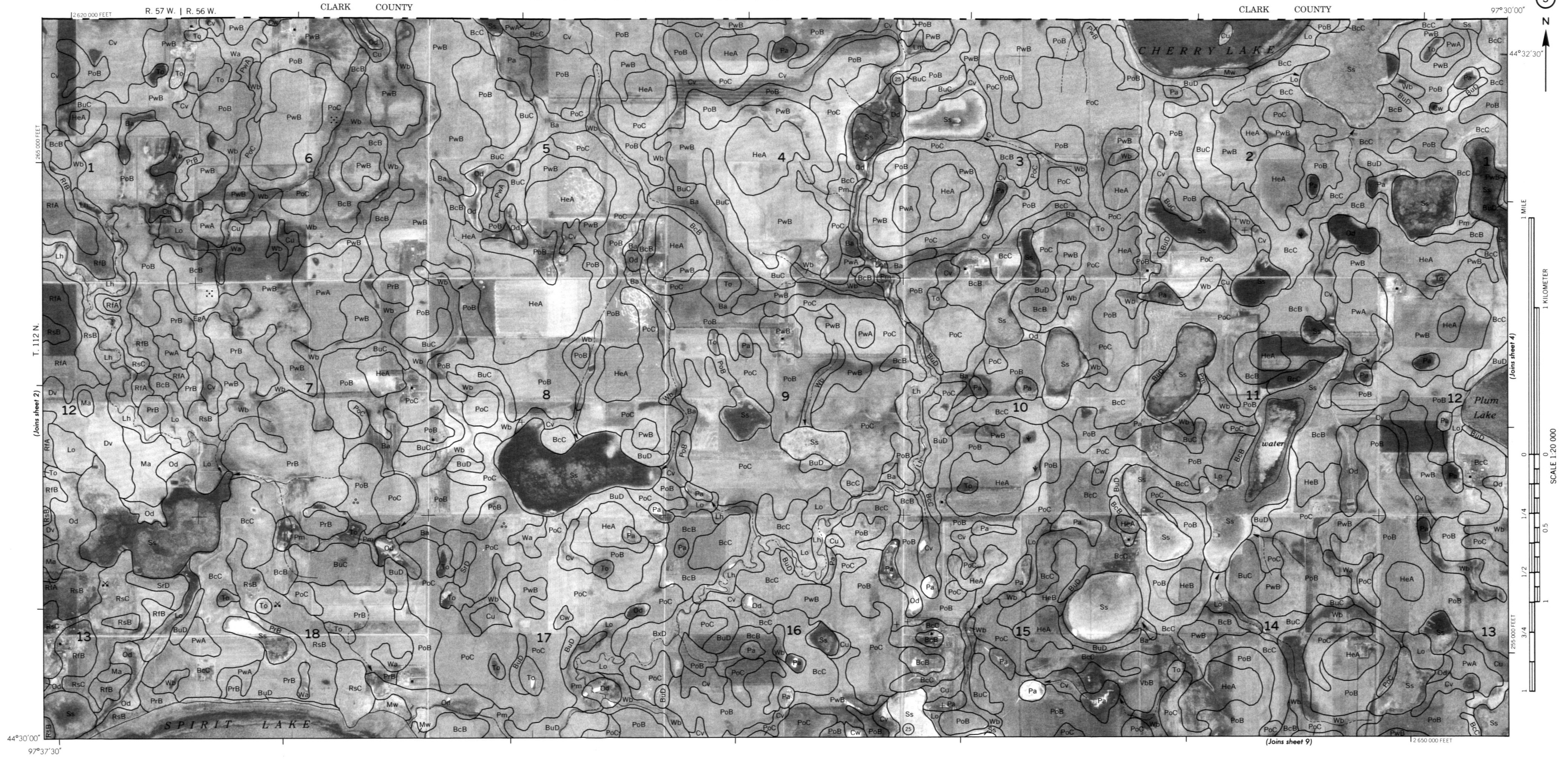

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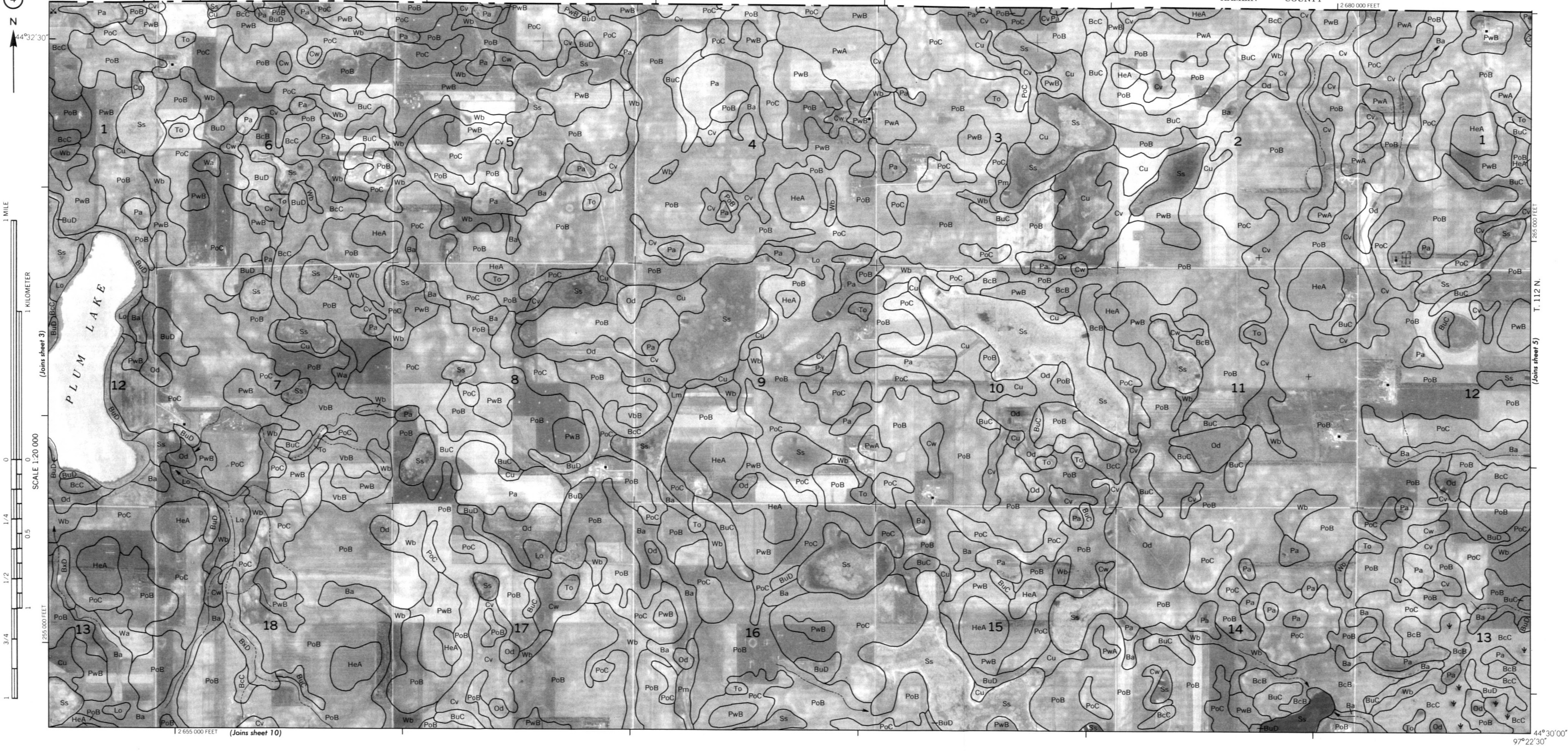
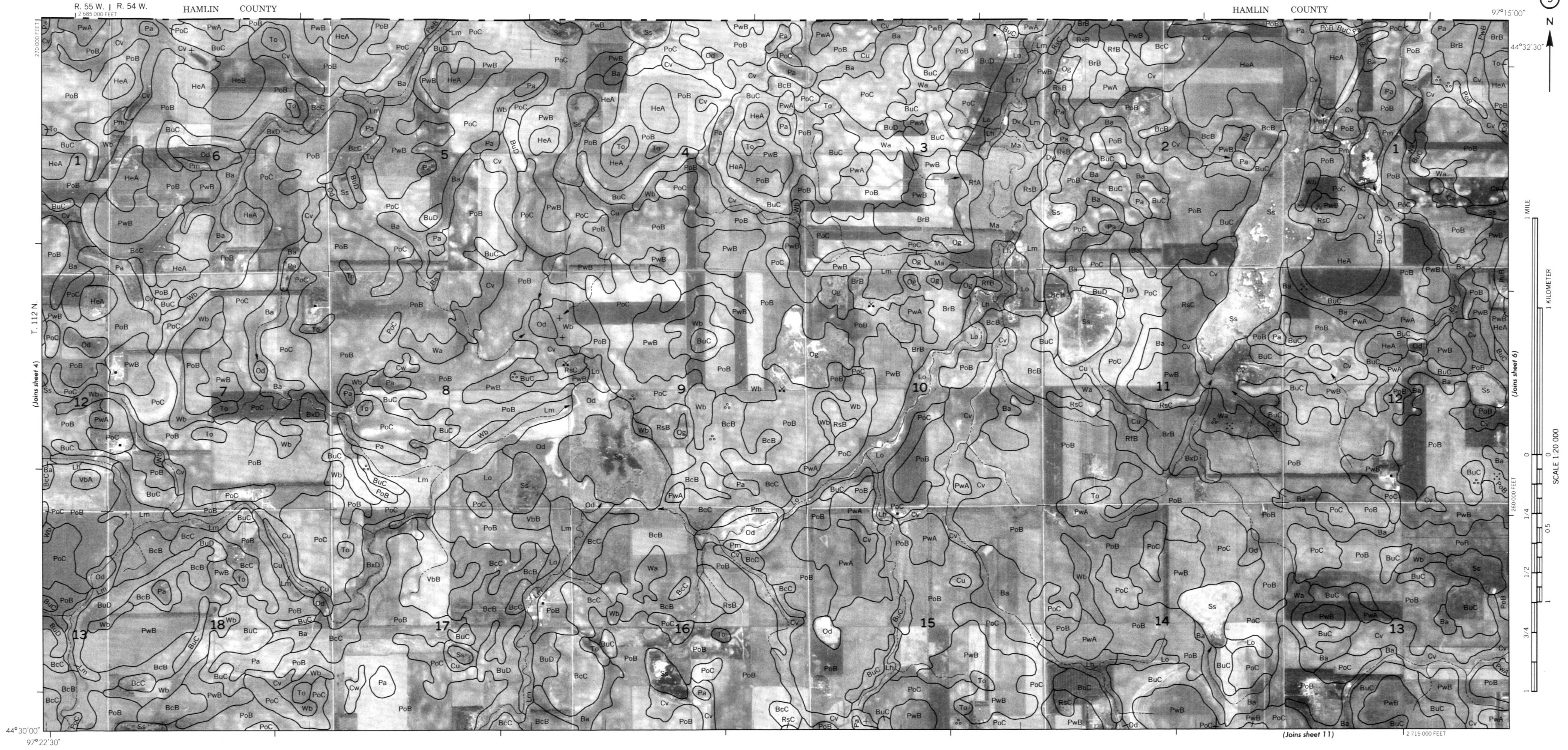
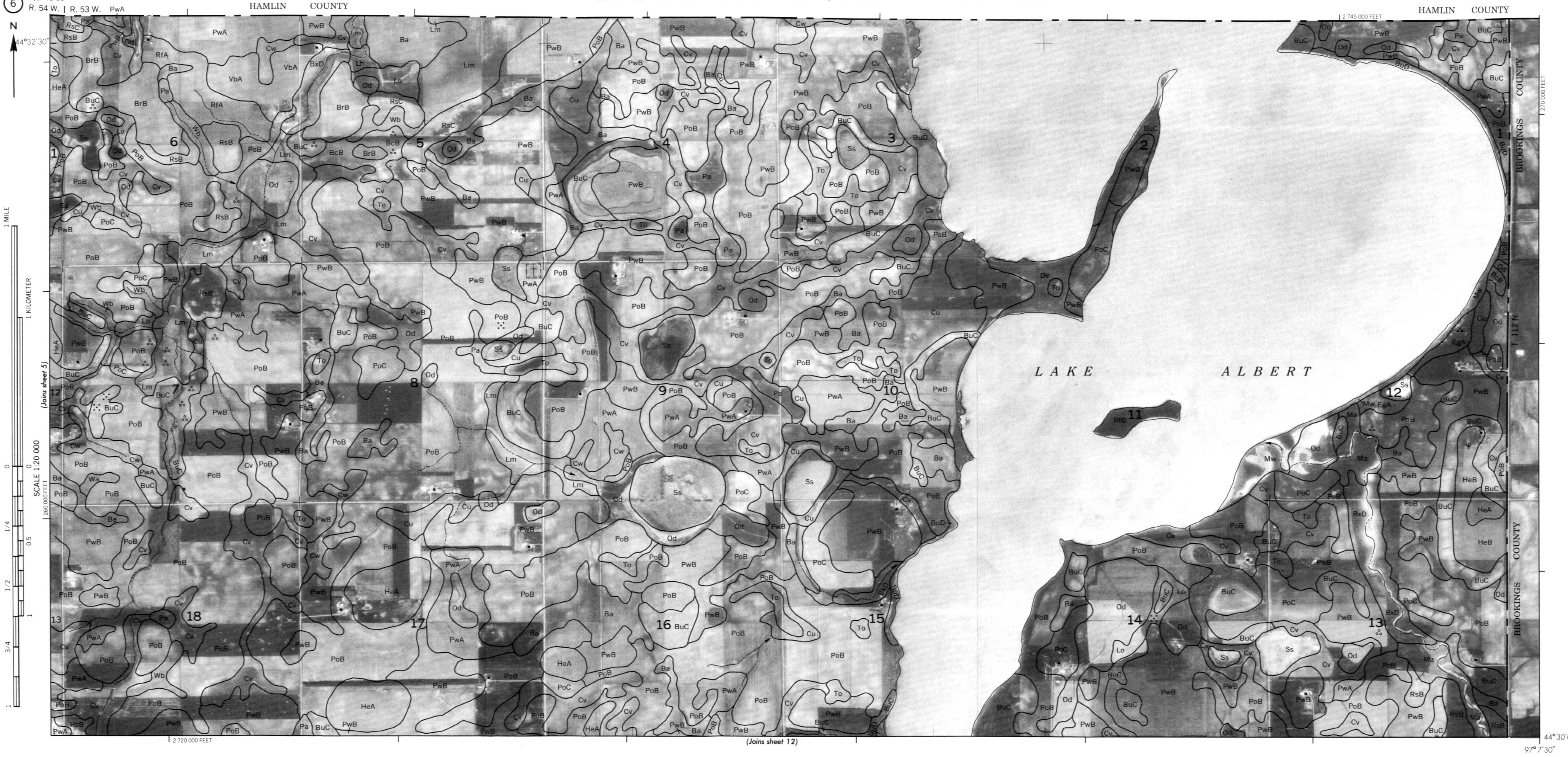
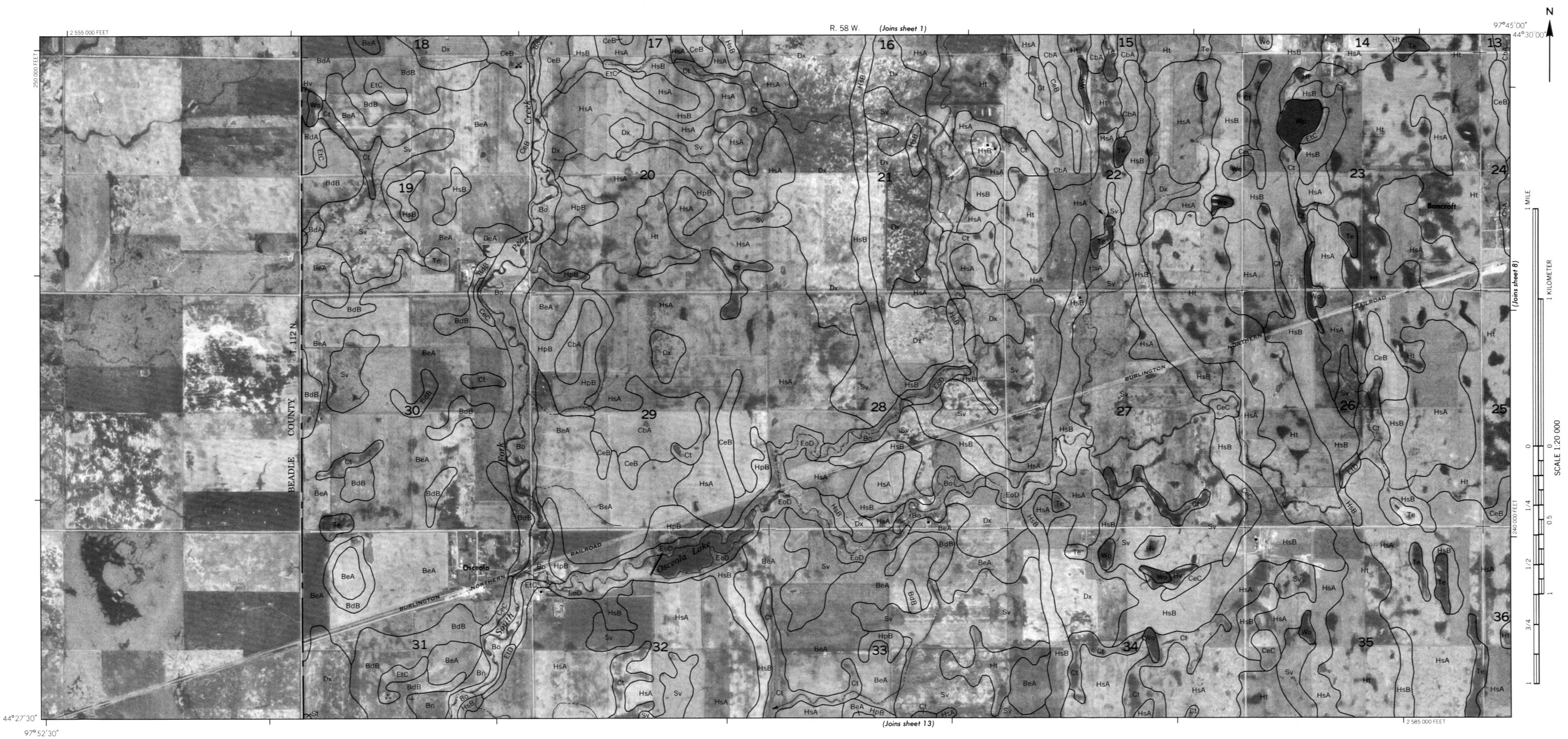


SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 5

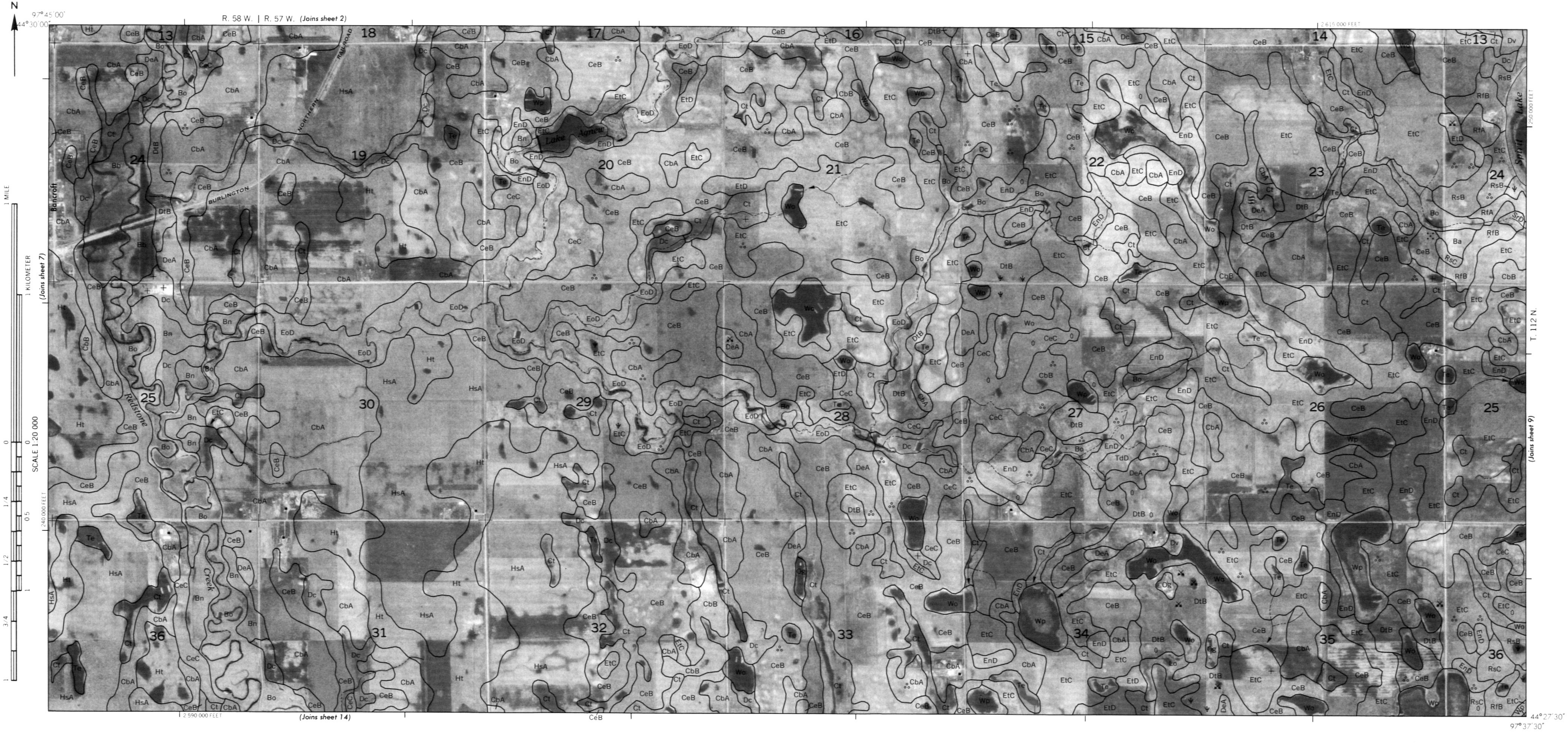


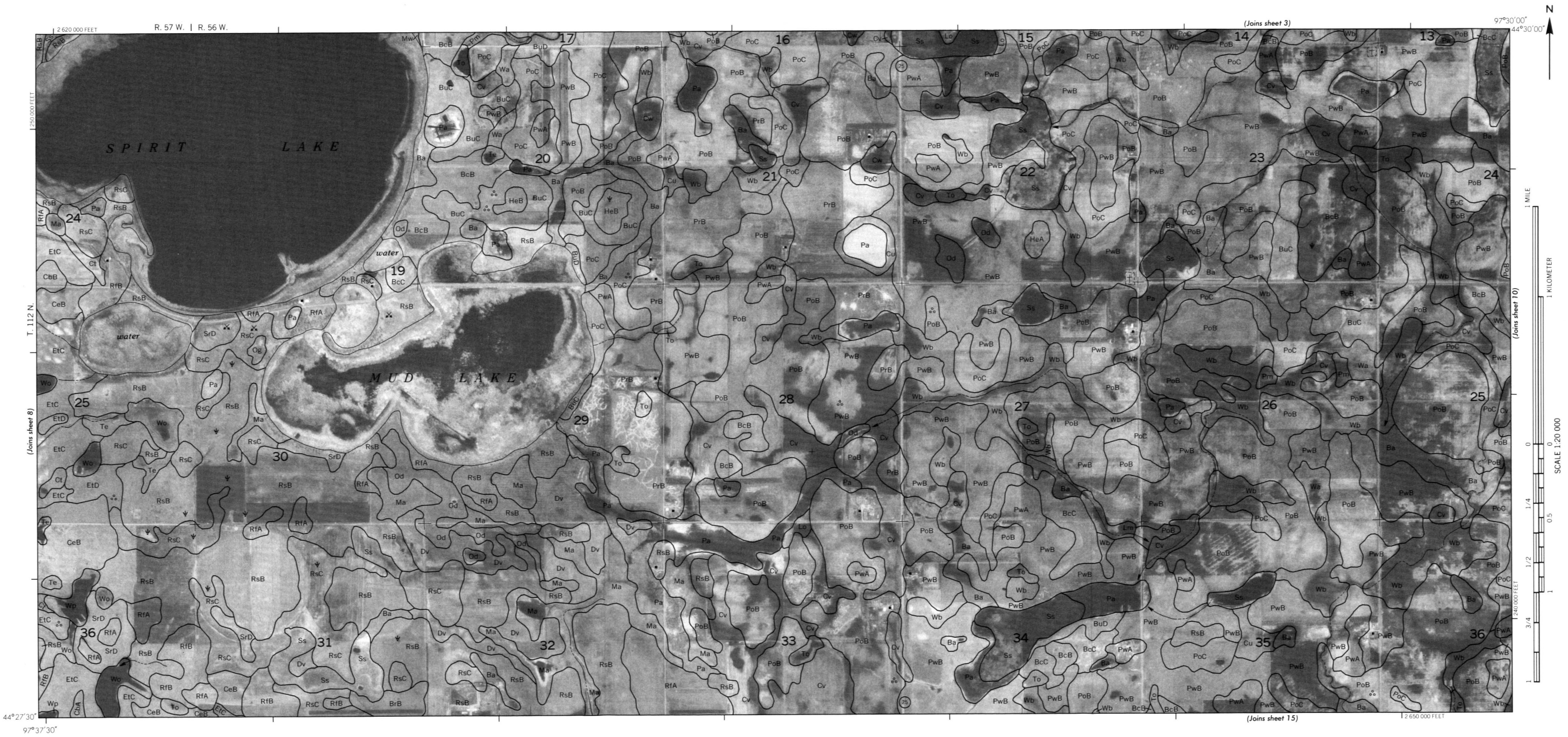
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 6



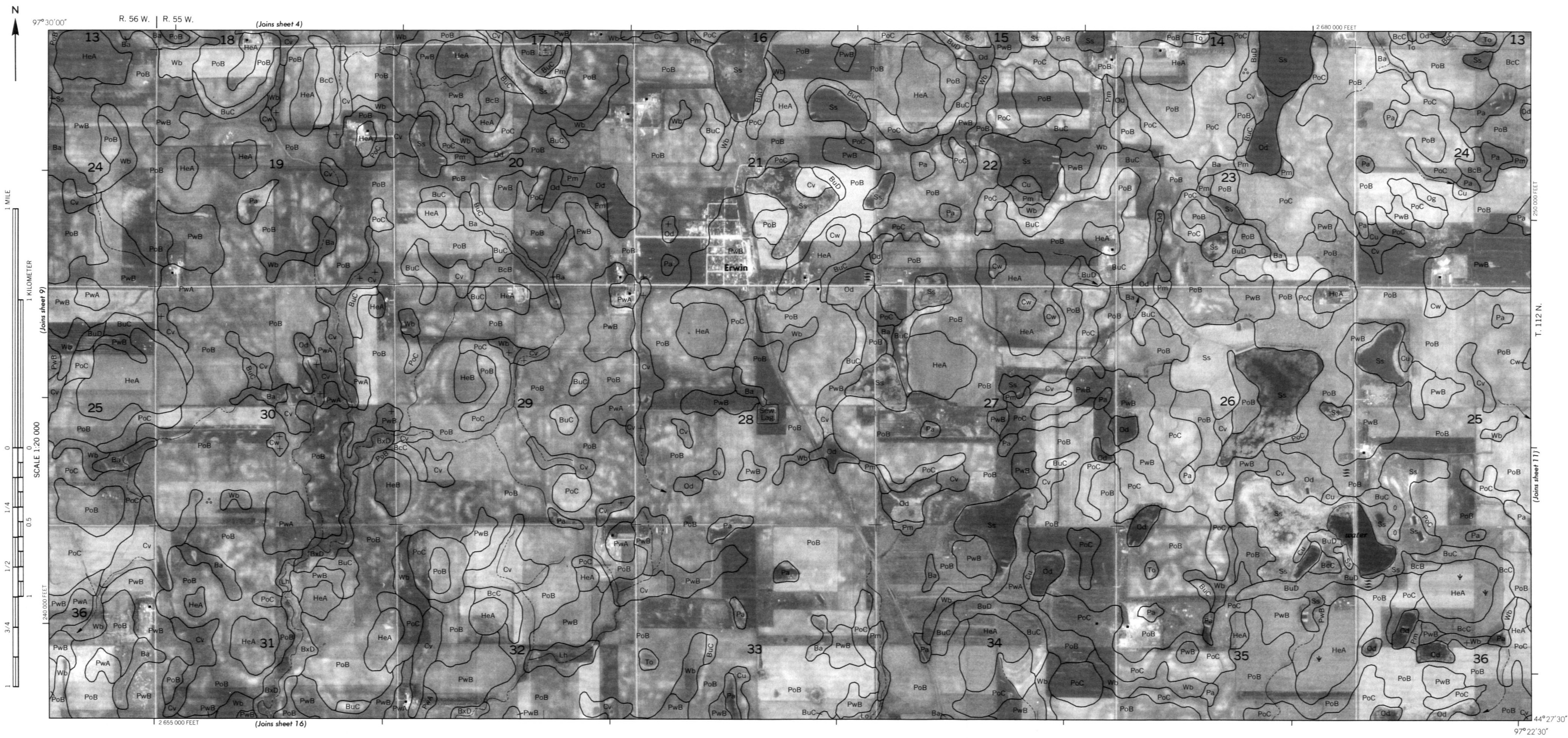

7
N
97°45'00"
44°30'00"
2 555 000 FEET
250 000 FEET
R. 58 W.
(Joins sheet 1)
(Joins sheet 8)
(Joins sheet 13)
T. 112 N.
BEADLE COUNTY
Osceola
Osceola Lake
Bancroft
Pearl Creek
South Fork
BURLINGTON NORTHERN RAILROAD
240 000 FEET
2 585 000 FEET
44°27'30"
97°52'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5

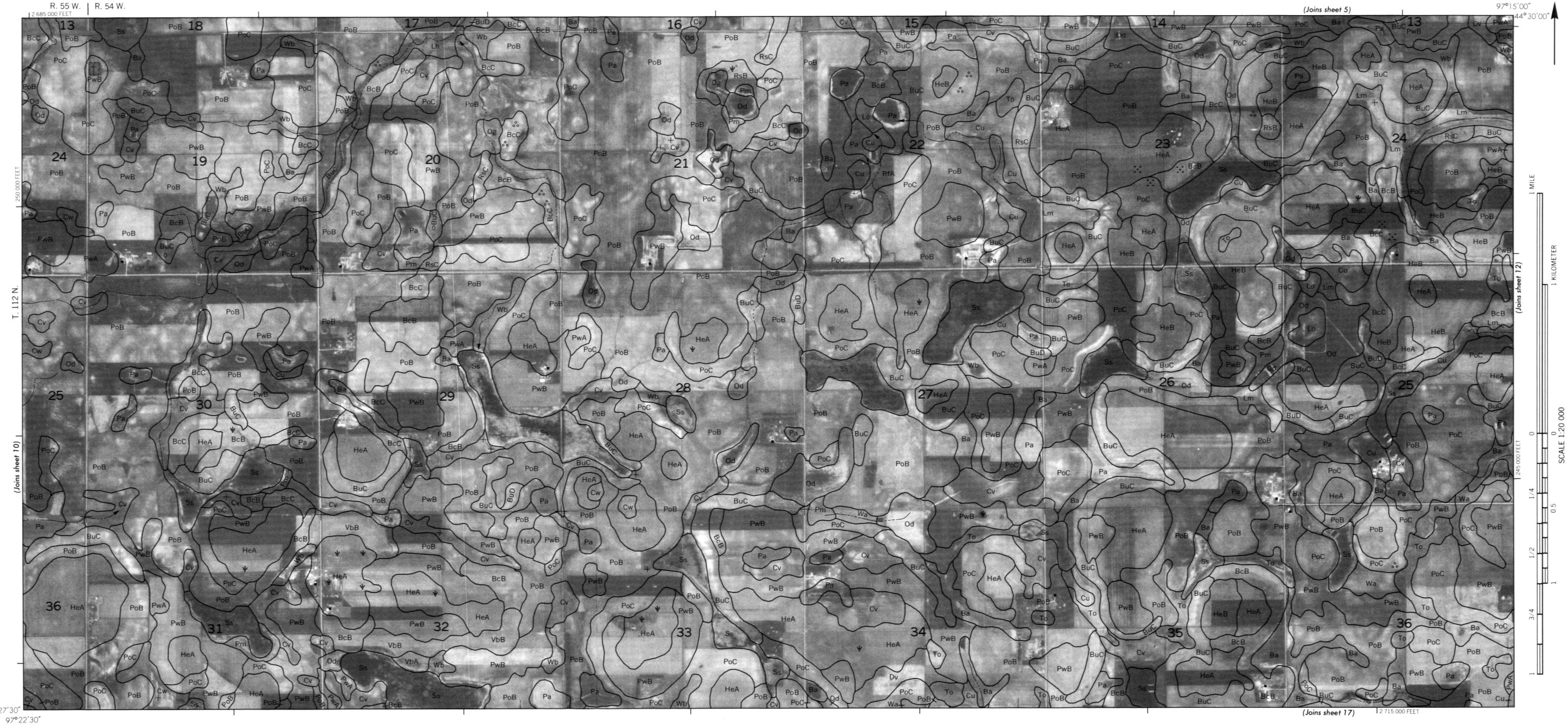
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 8




N
(Joins sheet 3)
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 15)
R. 57 W. | R. 56 W.
T. 112 N.
2 620 000 FEET
250 000 FEET
240 000 FEET
2 650 000 FEET
97°30′00″
44°30′00″
44°27′30″
97°37′30″
SPIRIT LAKE
MUD LAKE
water
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 10




N
R. 55 W.
R. 54 W.
2 685 000 FEET
(Joins sheet 5)
97°15'00"
44°30'00"
T. 112 N.
250 000 FEET
(Joins sheet 10)
(Joins sheet 12)
245 000 FEET
(Joins sheet 17)
2 715 000 FEET
44°27'30"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5
13
18
17
16
15
14
24
19
20
21
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23
25
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29
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32
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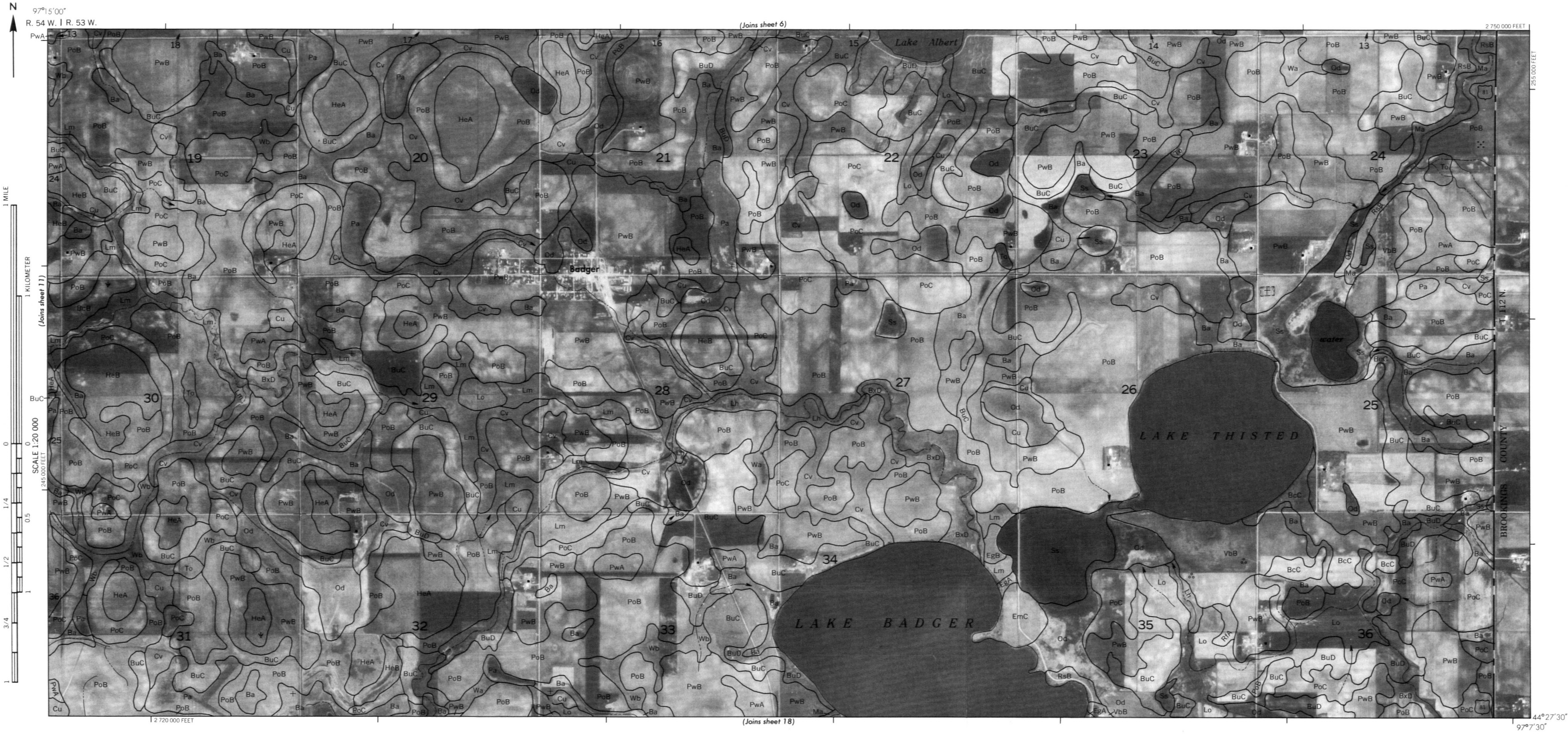
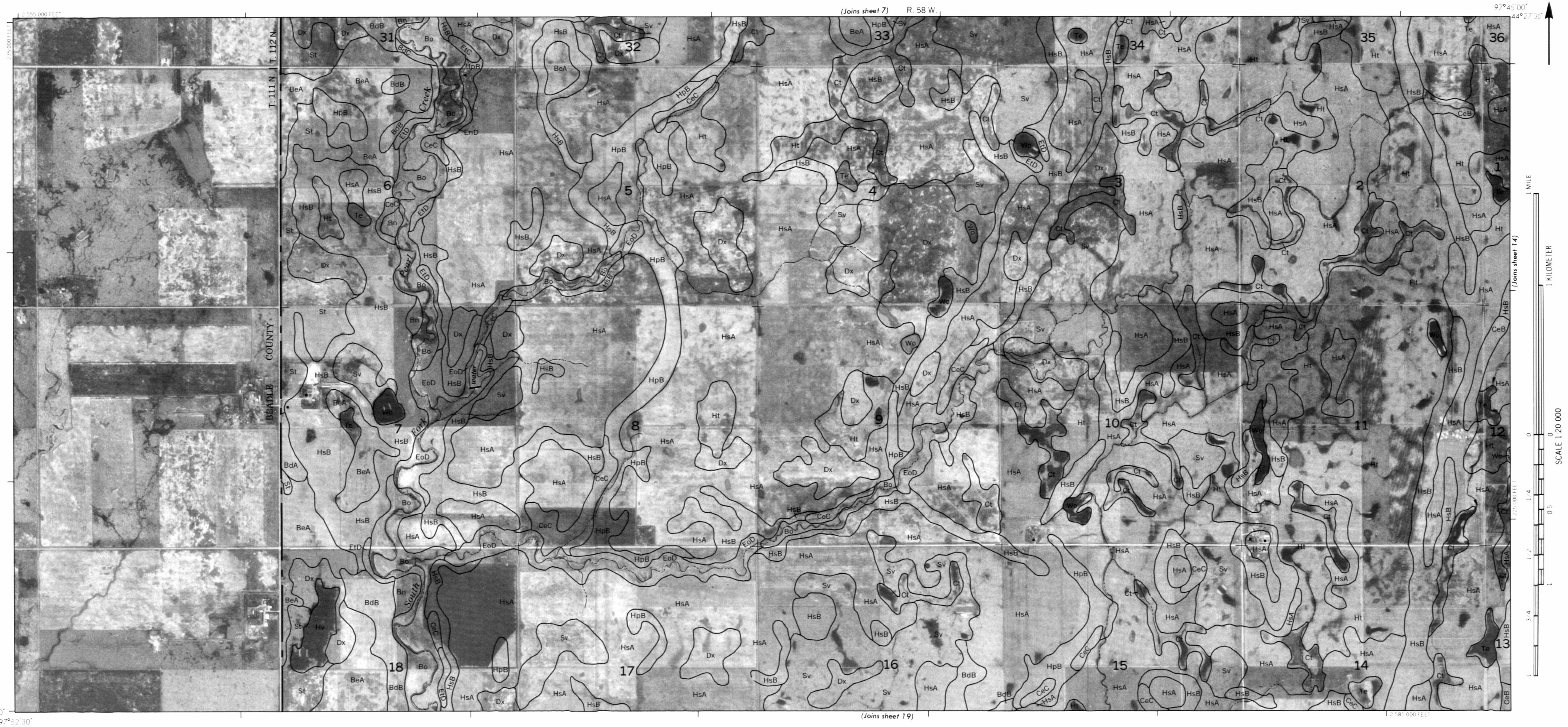
35

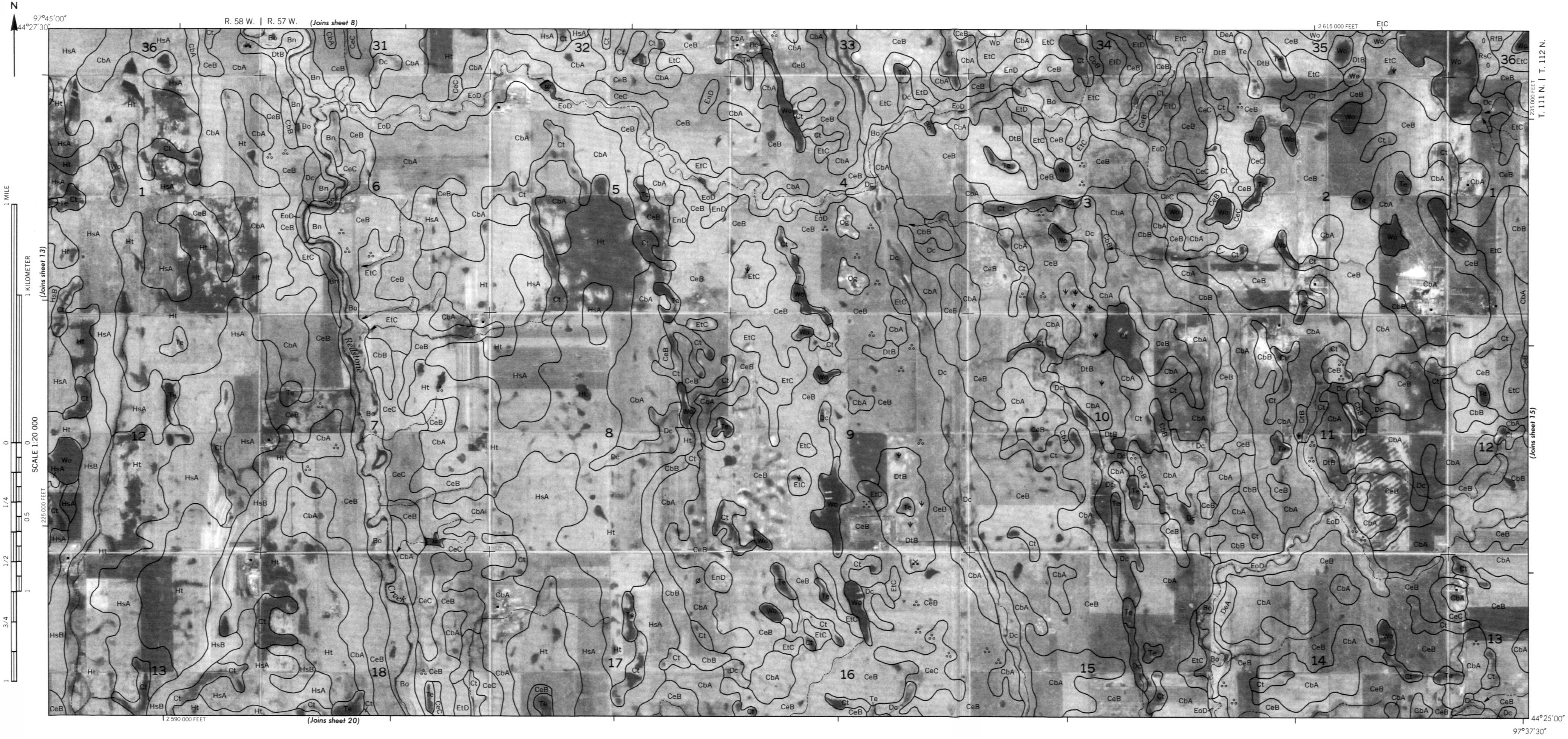

N
97°15′00″
R. 54 W. | R. 53 W.
(Joins sheet 6)
2 750 000 FEET
255 000 FEET
Lake Albert
Badger
LAKE THISTED
LAKE BADGER
water
(Joins sheet 11)
T. 112 N.
BROOKINGS COUNTY
1 MILE
1 KILOMETER
SCALE 1:20 000
245 000 FEET
2 720 000 FEET
(Joins sheet 18)
44°27′30″
97°7′30″

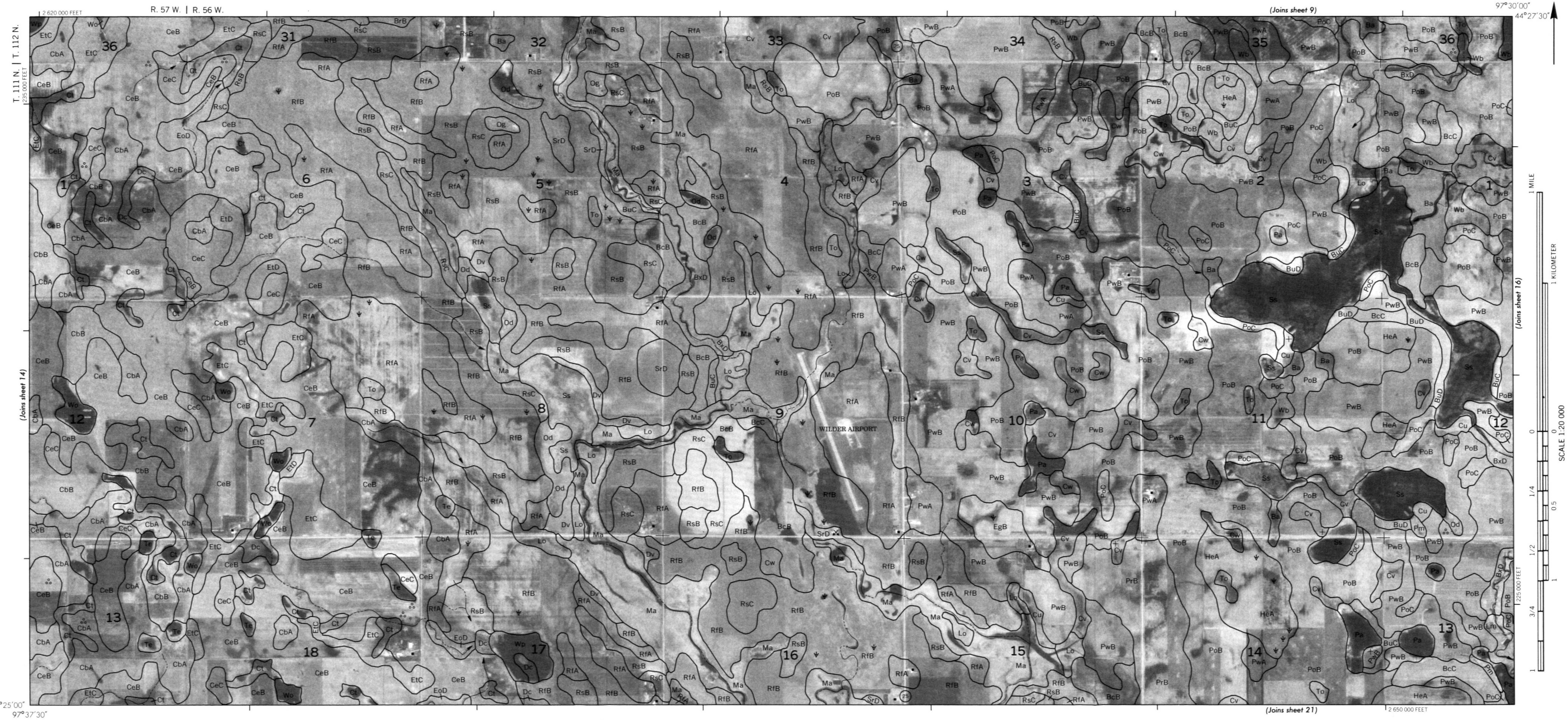
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 13

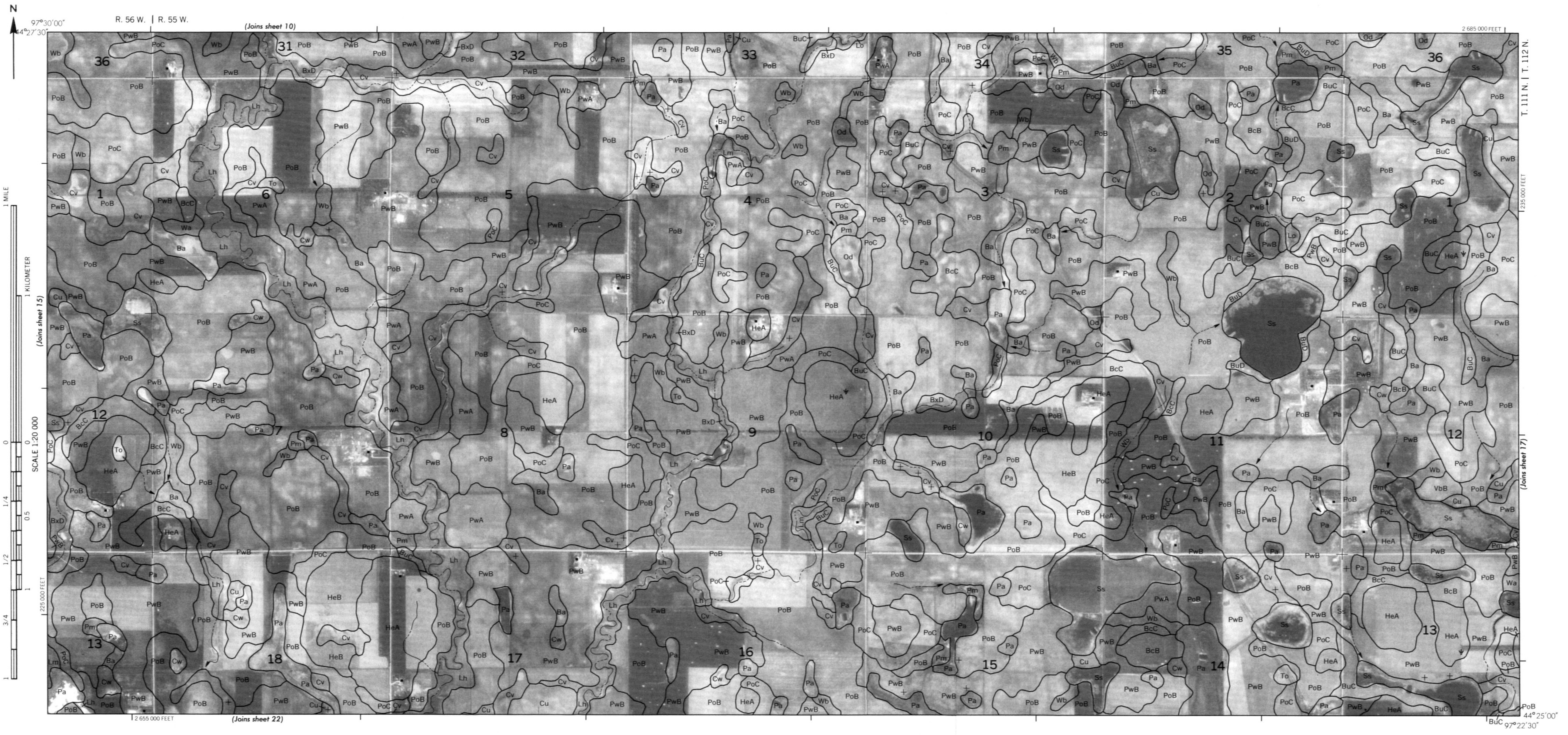
13

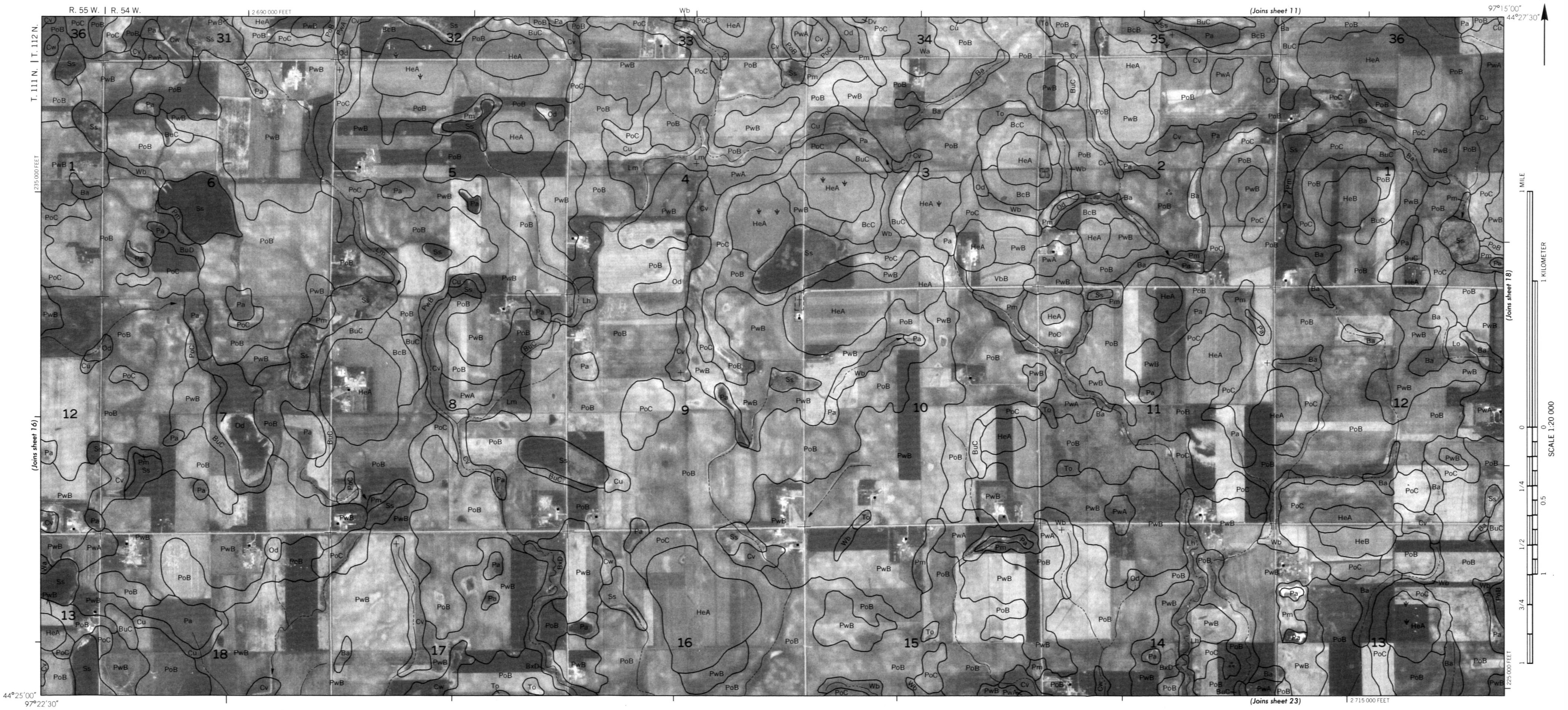


SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 14




N
R. 57 W. | R. 56 W.
T. 111 N. | T. 112 N.
2 620 000 FEET
235 000 FEET
2 650 000 FEET
225 000 FEET
(Joins sheet 9)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 21)
97°30'00"
44°27'30"
44°25'00"
97°37'30"
WILDER AIRPORT
1 MILE
1 KILOMETER
SCALE 1:20 000


N
97°30'00"
44°27'30"
R. 56 W. | R. 55 W.
(Joins sheet 10)
2 685 000 FEET
T. 112 N. | T. 111 N.
235 000 FEET
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 22)
2 655 000 FEET
225 000 FEET
44°25'00"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000


17
N
R. 55 W. | R. 54 W.
T. 111 N. | T. 112 N.
2 690 000 FEET
235 000 FEET
225 000 FEET
2 715 000 FEET
(Joins sheet 11)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 23)
97°15'00"
44°27'30"
44°25'00"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
36
31
32
33
34
35
36
1
6
5
4
3
2
1
12
7
8
9
10
11
12
13
18
17
16
15
14
13

SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 18

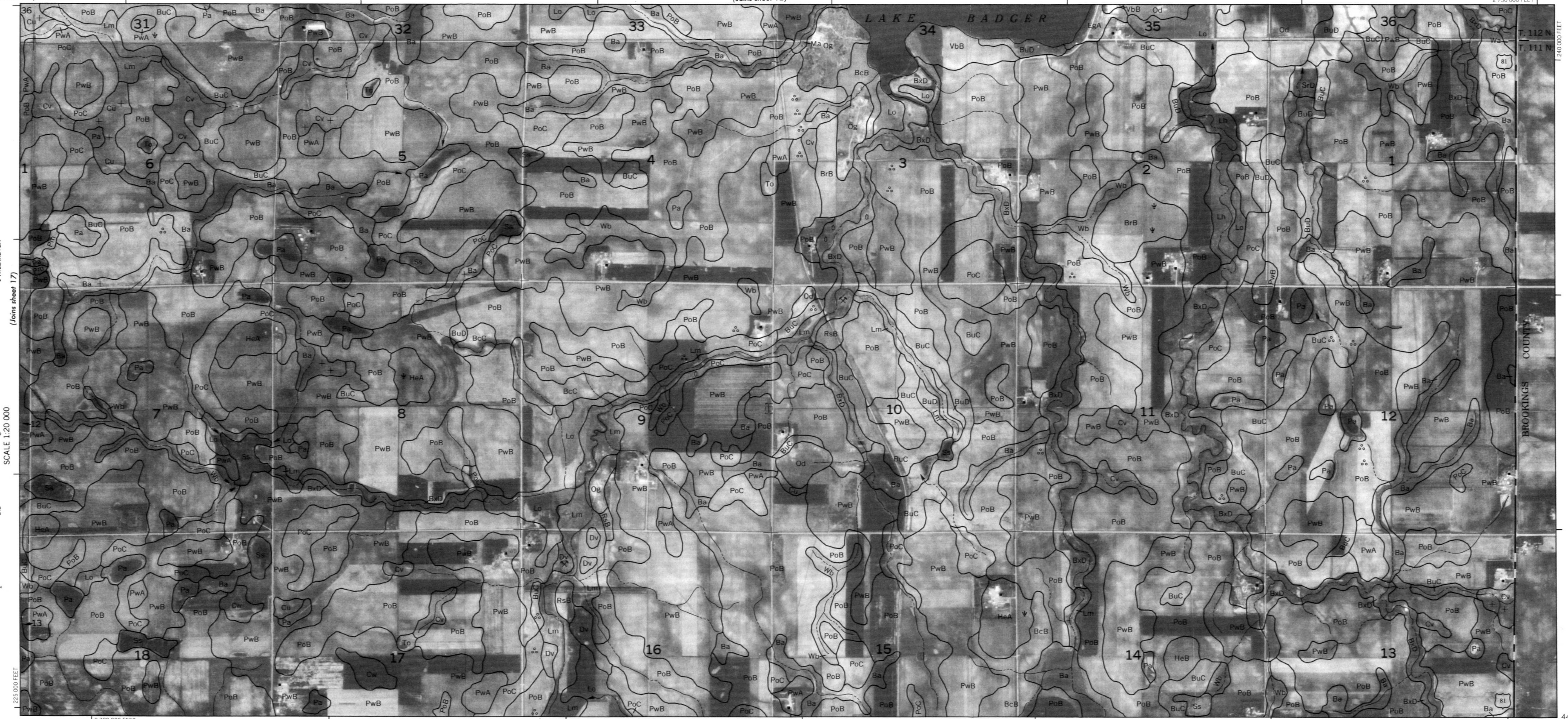
N

97°15'00"

R. 54 W. | R. 53 W.

(Joins sheet 12)

2 750 000 FEET



1 MILE

1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

0 0.5 1

225 000 FEET

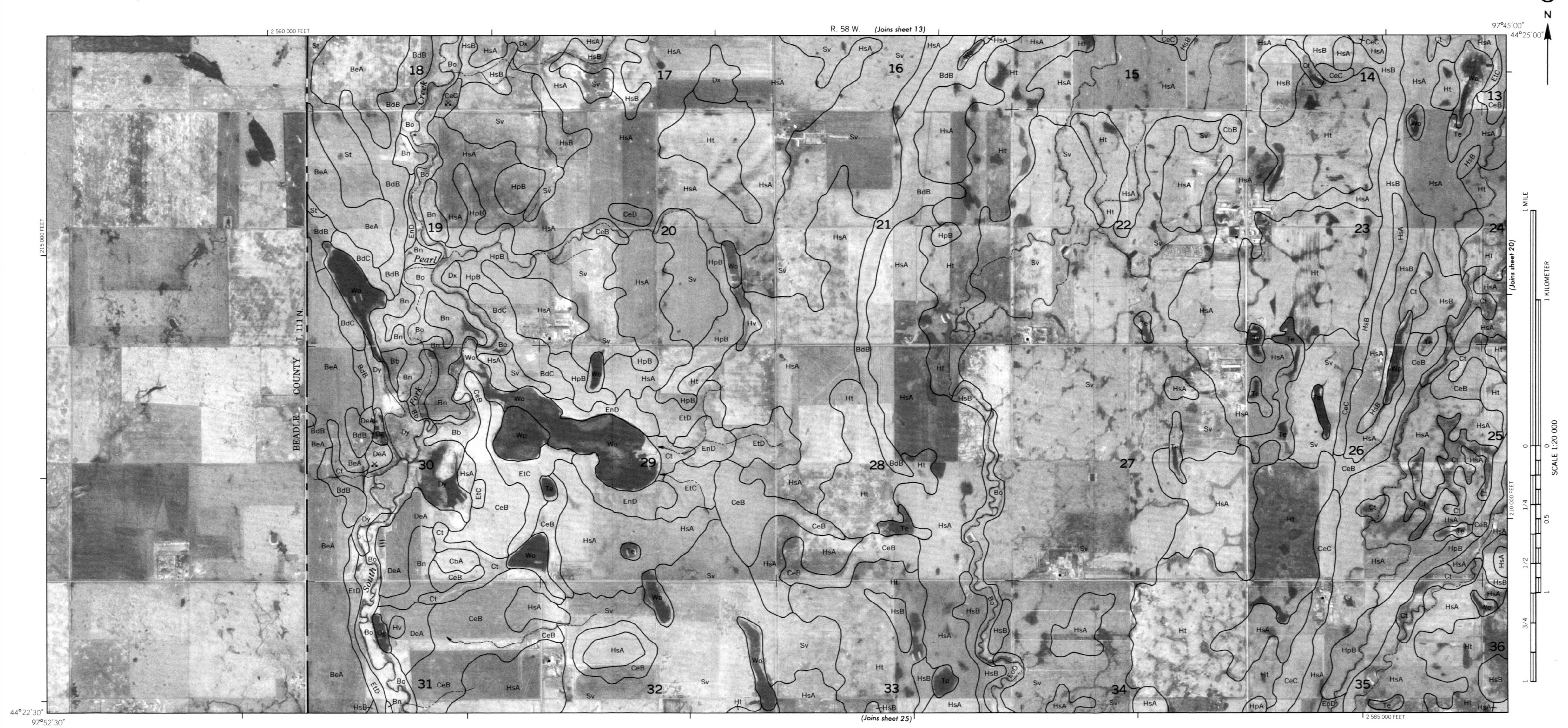
2 720 000 FEET

(Joins sheet 24)

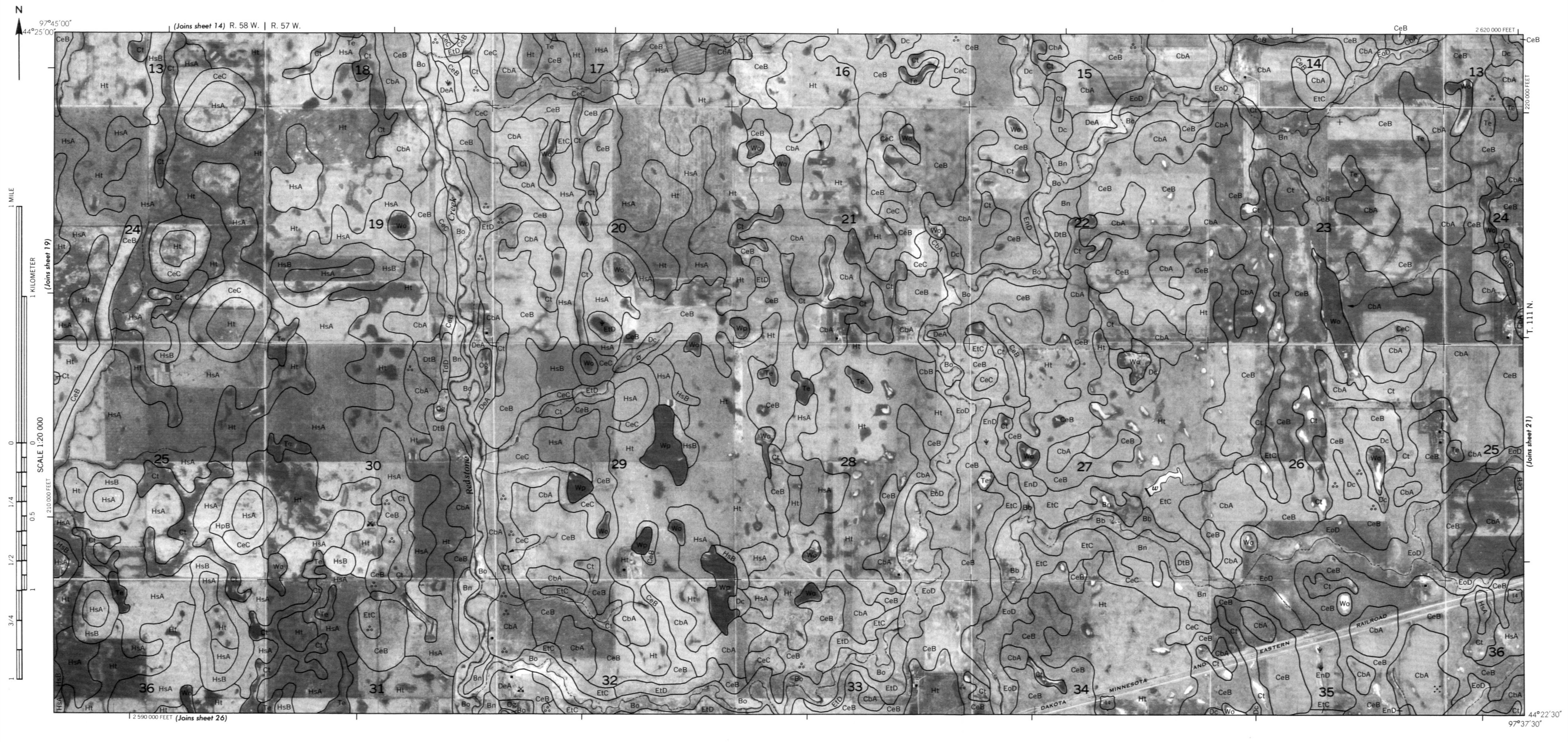
44°25'00"

97°7'30"

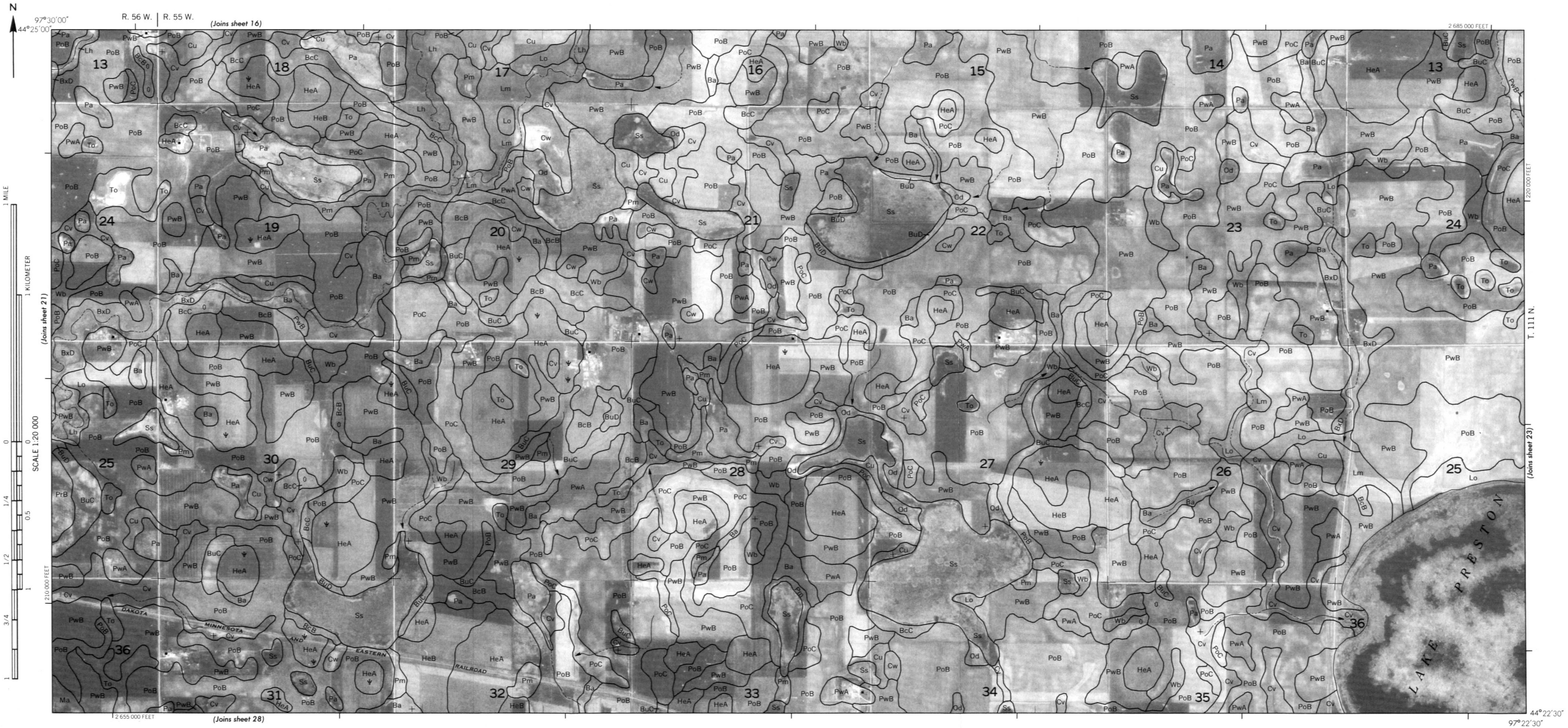
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 19



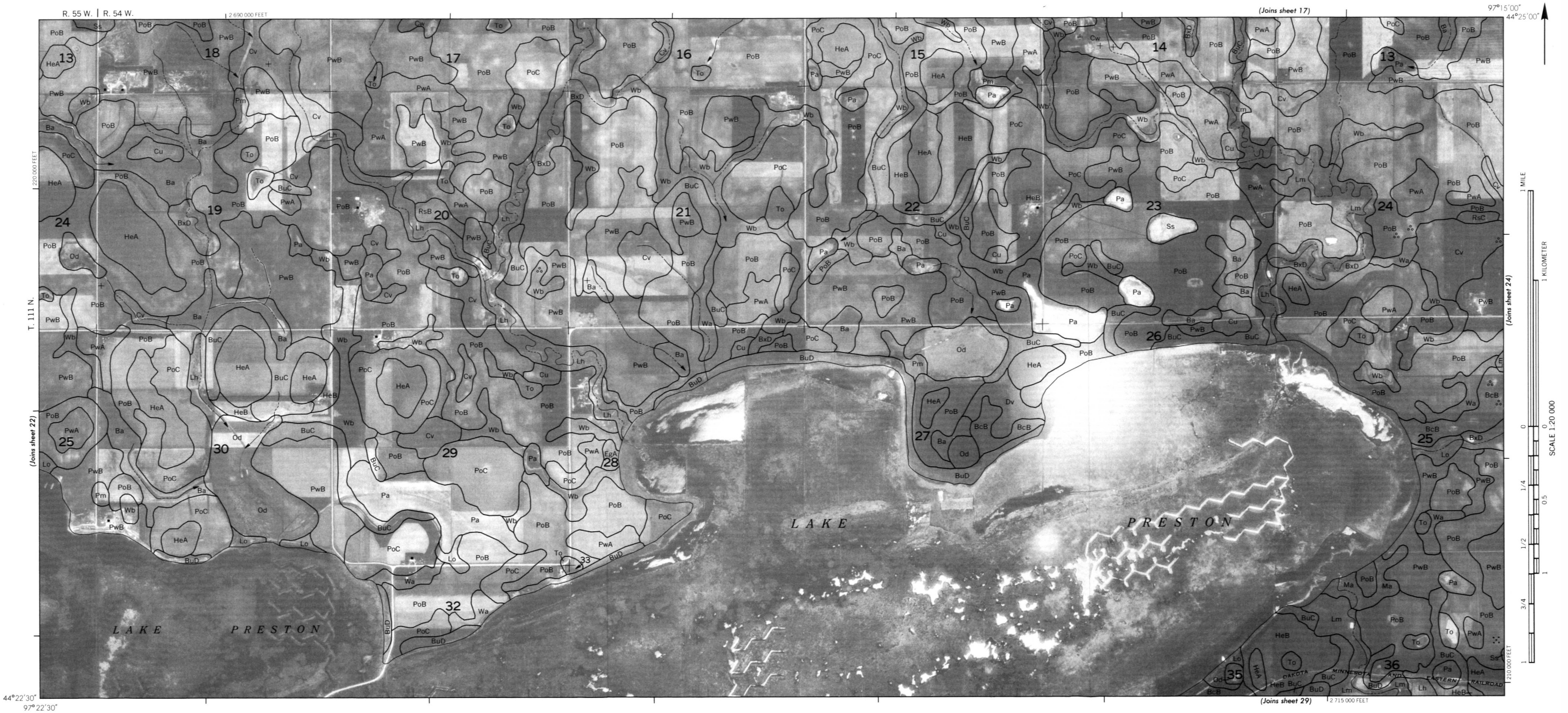
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 20




R. 57 W. | R. 56 W.
2 625 000 FEET
(Joins sheet 15)
97°30'00"
44°25'00"
N
220 000 FEET
T. 111 N.
(Joins sheet 20)
(Joins sheet 22)
DE SMET
Sewage Lagoon
DAKOTA
MINNESOTA
AND
EASTERN
RAILROAD
1 MILE
1 KILOMETER
SCALE 1:20 000
210 000 FEET
44°22'30"
97°37'30"
(Joins sheet 27)
2 650 000 FEET

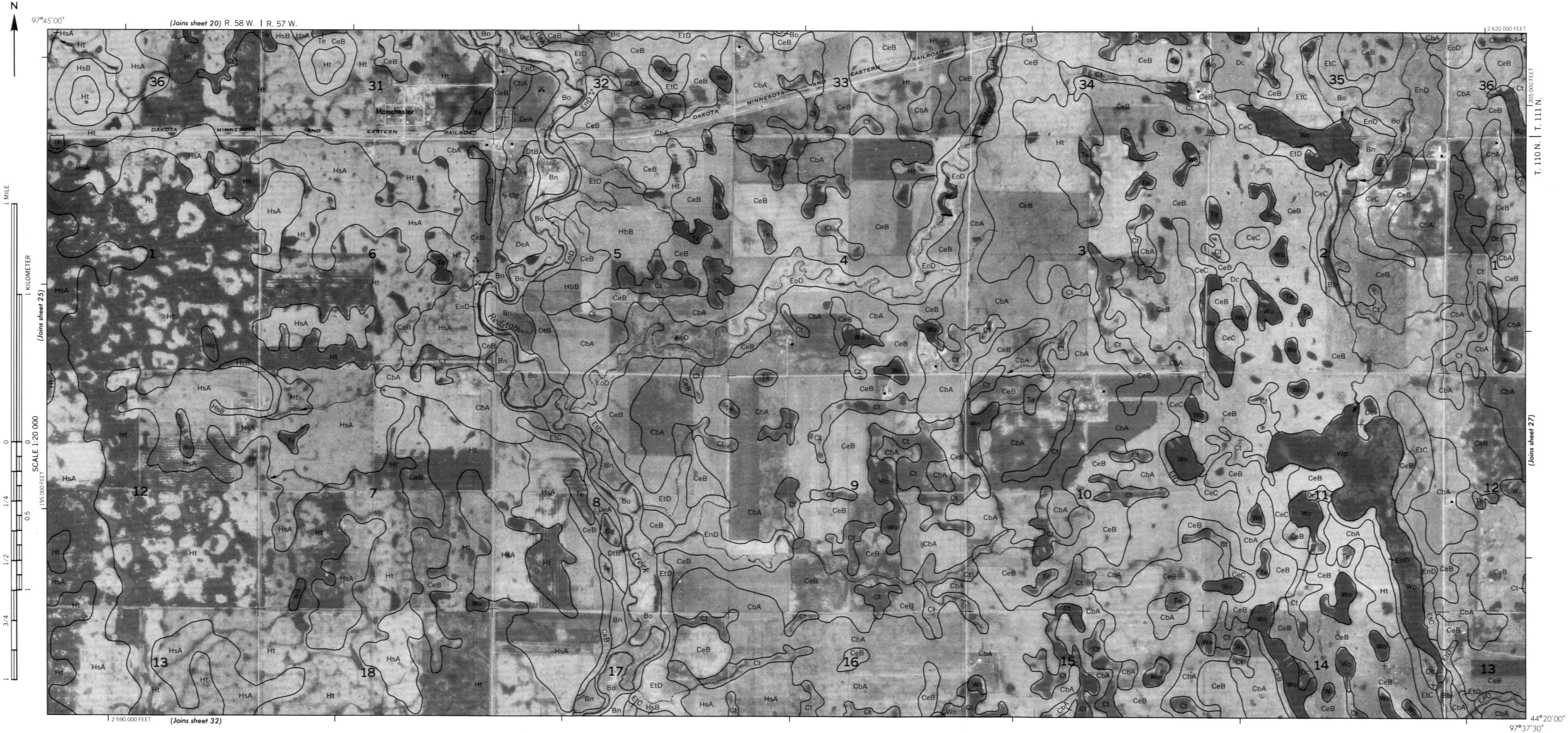

N
97°30'00"
44°25'00"
R. 56 W. | R. 55 W.
(Joins sheet 16)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 28)
2 685 000 FEET
220 000 FEET
210 000 FEET
2 655 000 FEET
T. 111 N.
44°22'30"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
DAKOTA MINNESOTA AND EASTERN RAILROAD
LAKE PRESTON
13 14 15 16 17 18
24 23 22 21 20 19
25 26 27 28 29 30
36 35 34 33 32 31

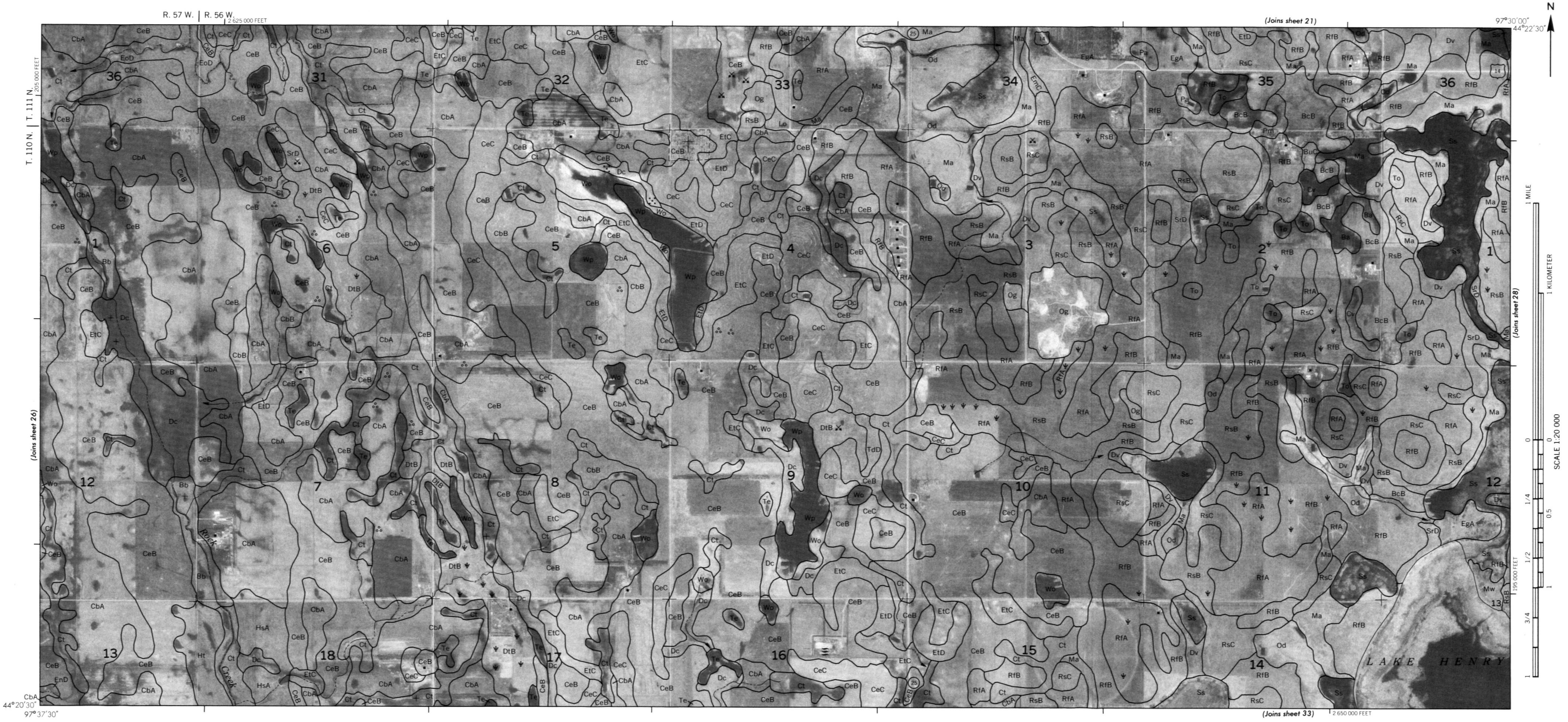
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 23



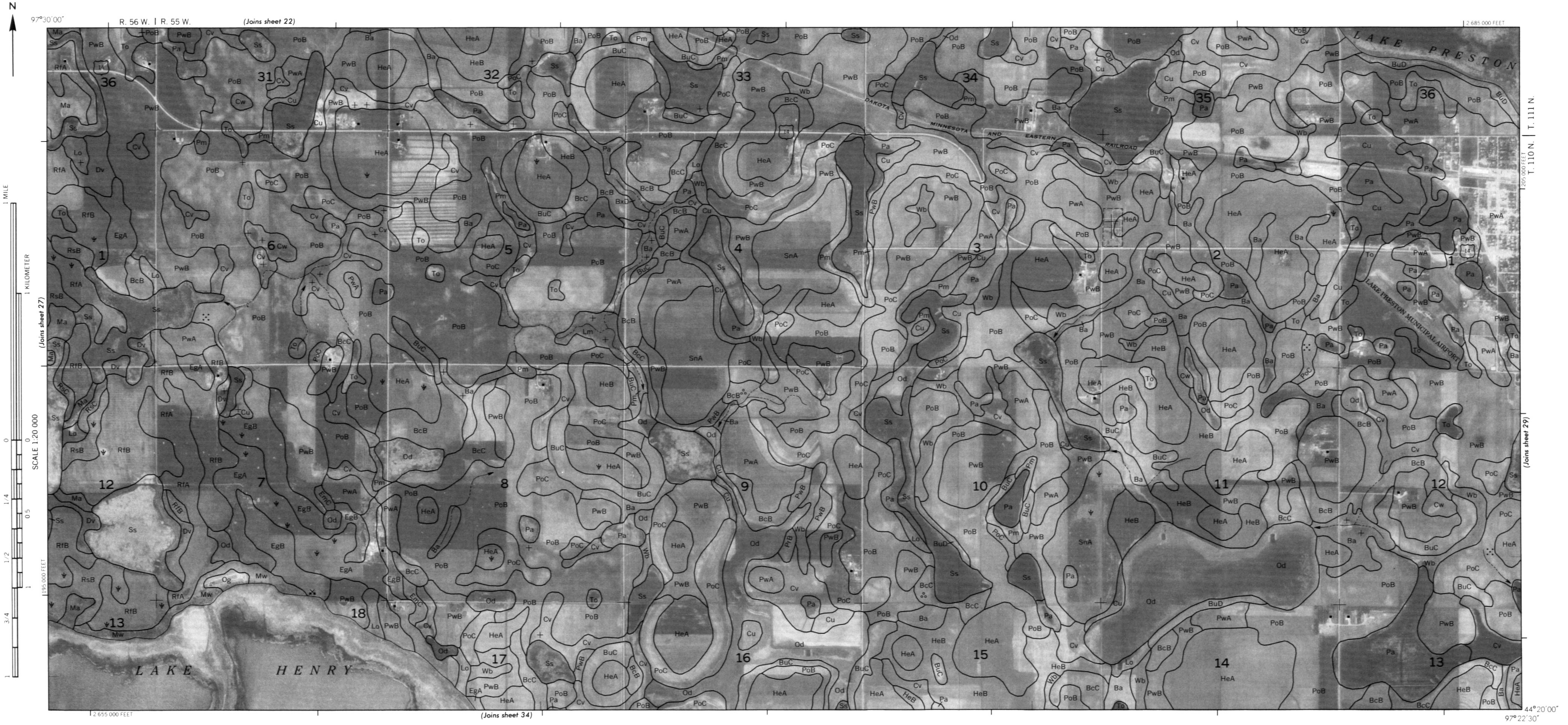

N
97°15'00"
R. 54 W. | R. 53 W.
(Joins sheet 18)
2 750 000 FEET
225 000 FEET
(Joins sheet 23)
SCALE 1:20 000
1 MILE
1 KILOMETER
T. 111 N.
BROOKINGS COUNTY
Hetland
DAKOTA MINNESOTA AND EASTERN RAILROAD
210 000 FEET
2 720 000 FEET
(Joins sheet 30)
44°22'30"
97°7'30"
18
17
16
15
14
13
19
20
21
22
23
24
30
29
28
27
26
25
31
32
33
34
35
36

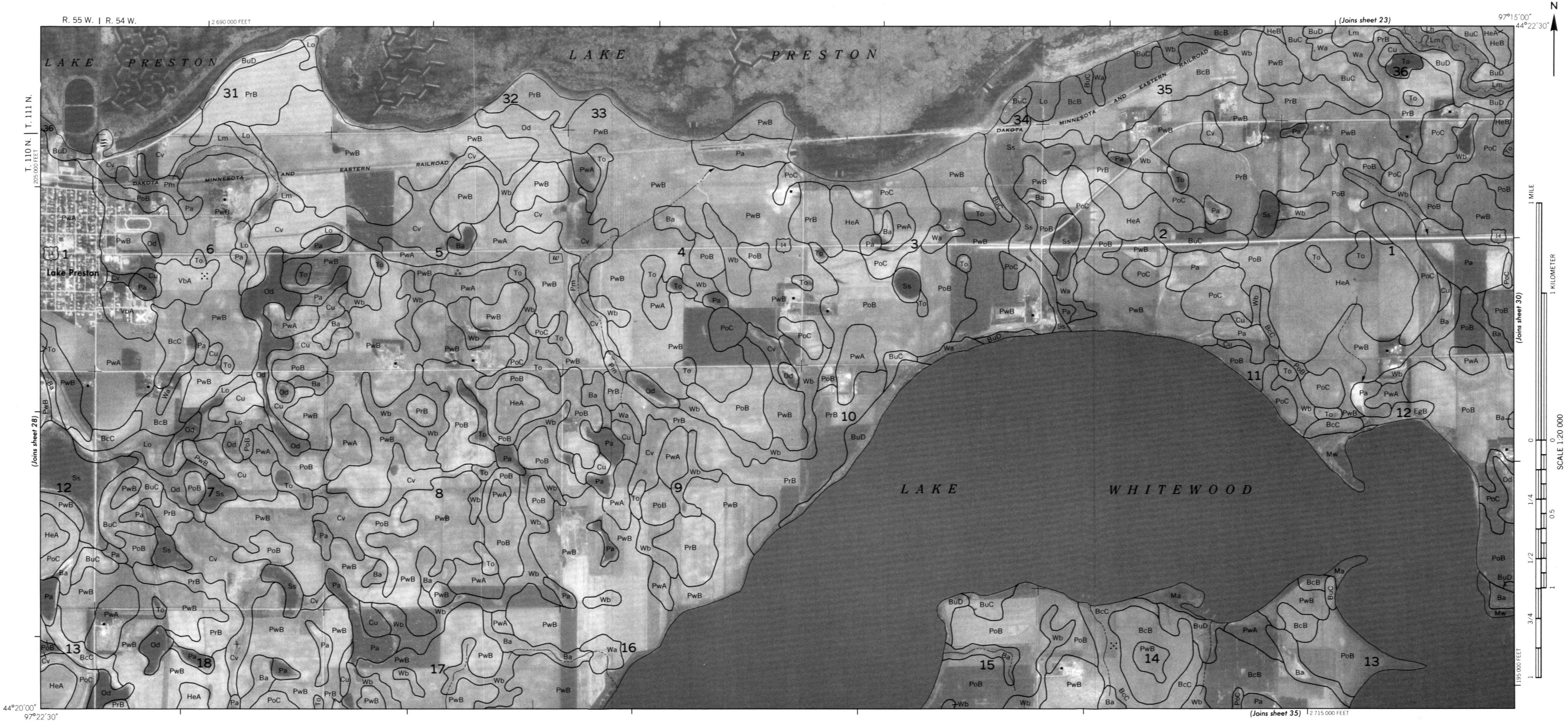

N
R. 58 W.
(Joins sheet 19)
(Joins sheet 26)
(Joins sheet 31)
2 560 000 FEET
2 585 000 FEET
200 000 FEET
195 000 FEET
97°45'00"
44°22'30"
44°20'00"
97°52'30"
T. 111 N.
T. 110 N.
BEADLE COUNTY
Iroquois
DAKOTA MINNESOTA AND EASTERN RAILROAD
South Fork Pearl Creek
Lake Iroquois
Sew Lag
1 MILE
1 KILOMETER
SCALE 1:20 000
31
32
33
34
35
36
6
5
4
3
2
1
7
8
9
10
11
12
18
17
16
15
14
13

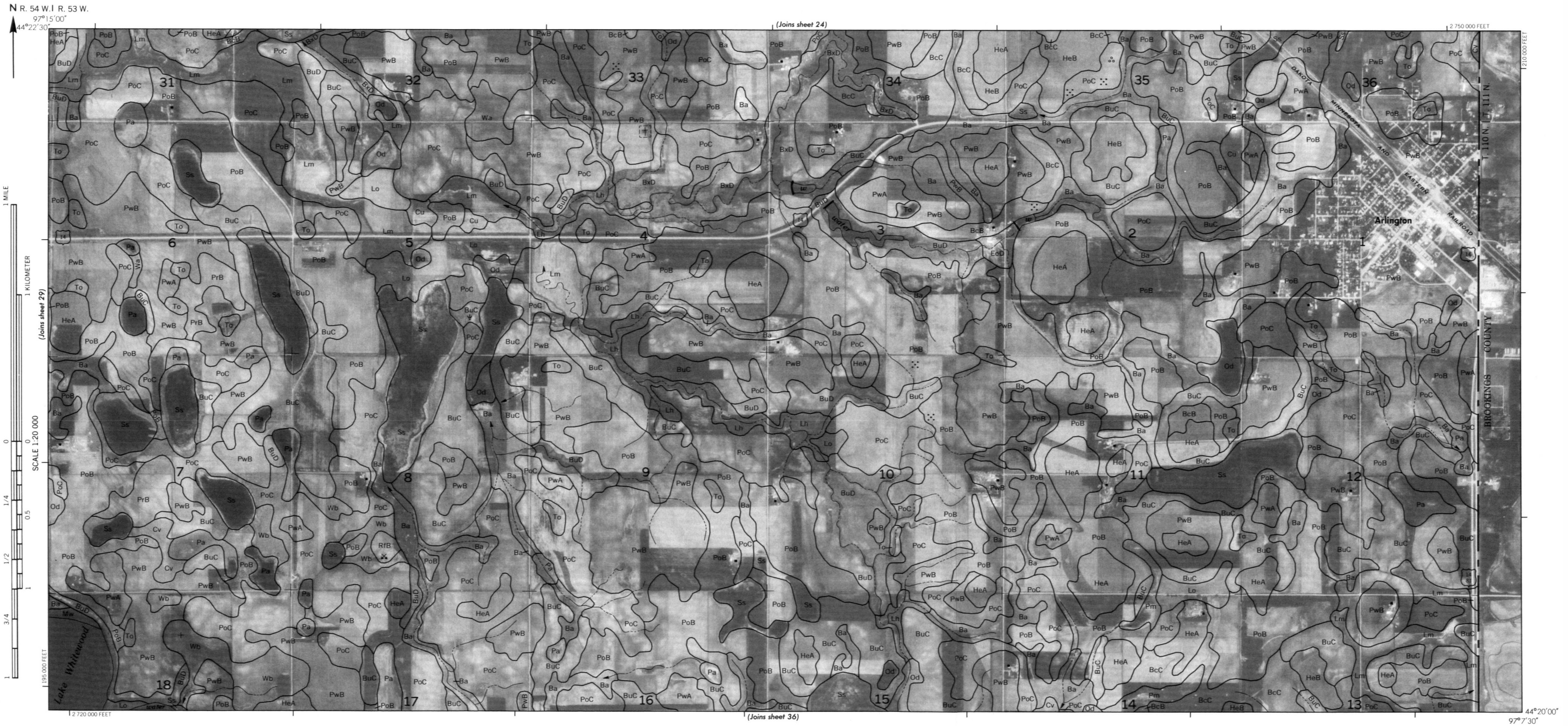

N
97°45'00"
(Joins sheet 20) R. 58 W. | R. 57 W.
2 620 000 FEET
205 000 FEET
T. 110 N. | T. 111 N.
Manchester
DAKOTA MINNESOTA AND EASTERN RAILROAD
Redstone Creek
1 MILE
1 KILOMETER
SCALE 1:20 000
(Joins sheet 25)
195 000 FEET
(Joins sheet 27)
2 590 000 FEET
(Joins sheet 32)
44°20'00"
97°37'30"


27
N
R. 57 W. | R. 56 W.
2 625 000 FEET
(Joins sheet 21)
97°30'00"
44°22'30"
T. 111 N.
T. 110 N.
205 000 FEET
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 33)
2 650 000 FEET
195 000 FEET
44°20'30"
97°37'30"
LAKE HENRY
Rock Creek
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 28

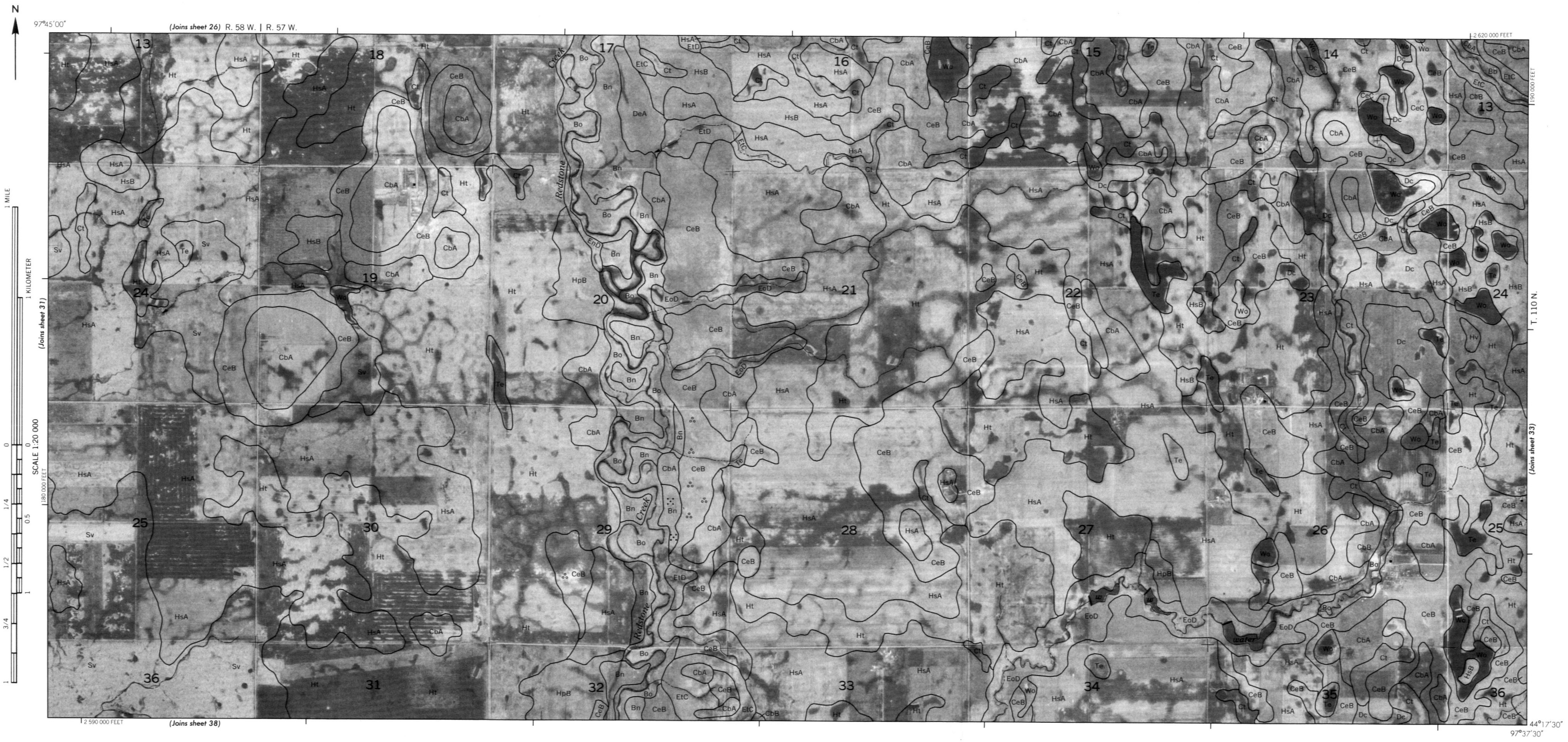


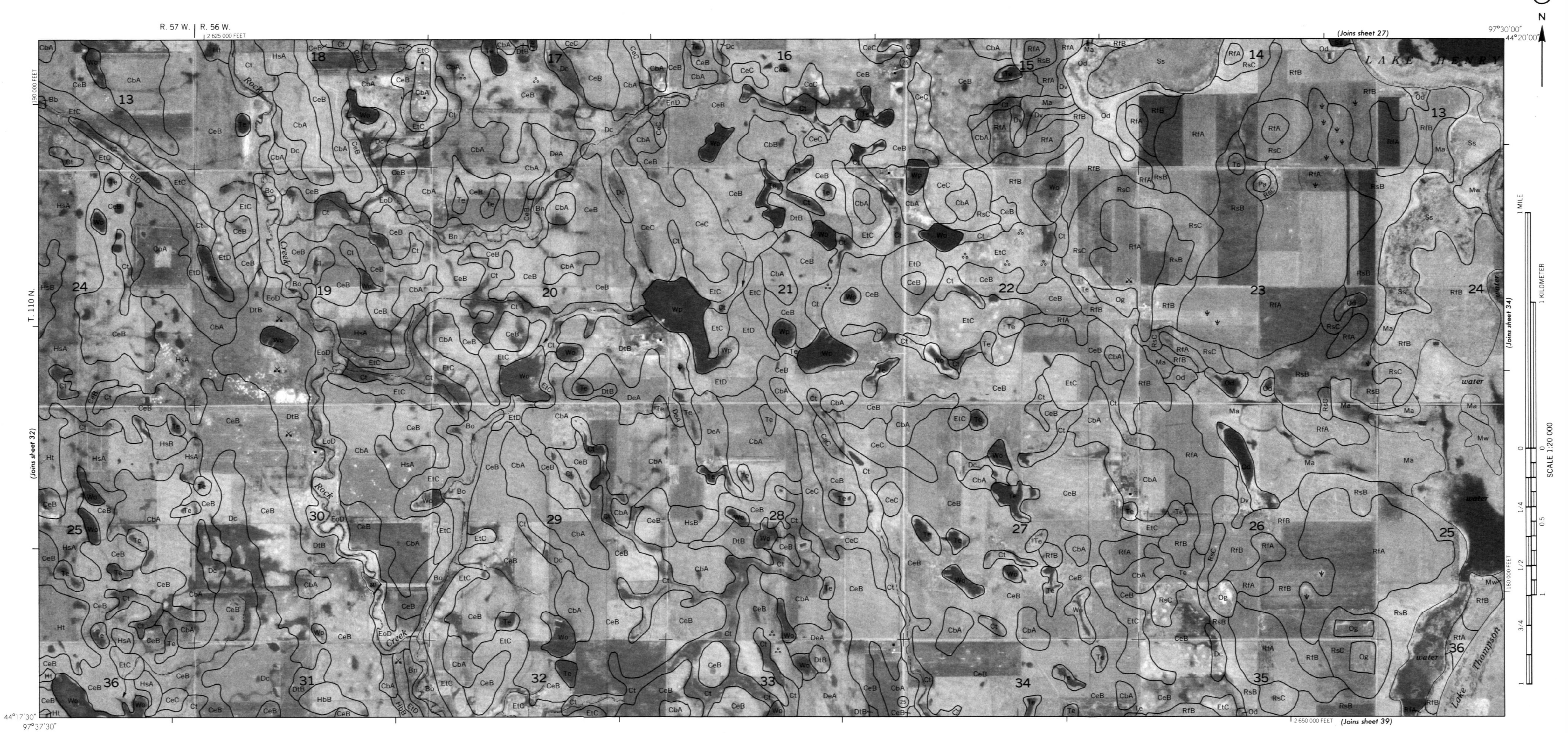

29
N
R. 55 W. | R. 54 W.
2 690 000 FEET
(Joins sheet 23)
97°15'00"
44°22'30"
T. 111 N.
T. 110 N.
205 000 FEET
LAKE PRESTON
LAKE PRESTON
Lake Preston
DAKOTA MINNESOTA AND EASTERN RAILROAD
(Joins sheet 28)
(Joins sheet 30)
LAKE WHITEWOOD
1 MILE
1 KILOMETER
SCALE 1:20 000
195 000 FEET
44°20'00"
97°22'30"
(Joins sheet 35)
2 715 000 FEET

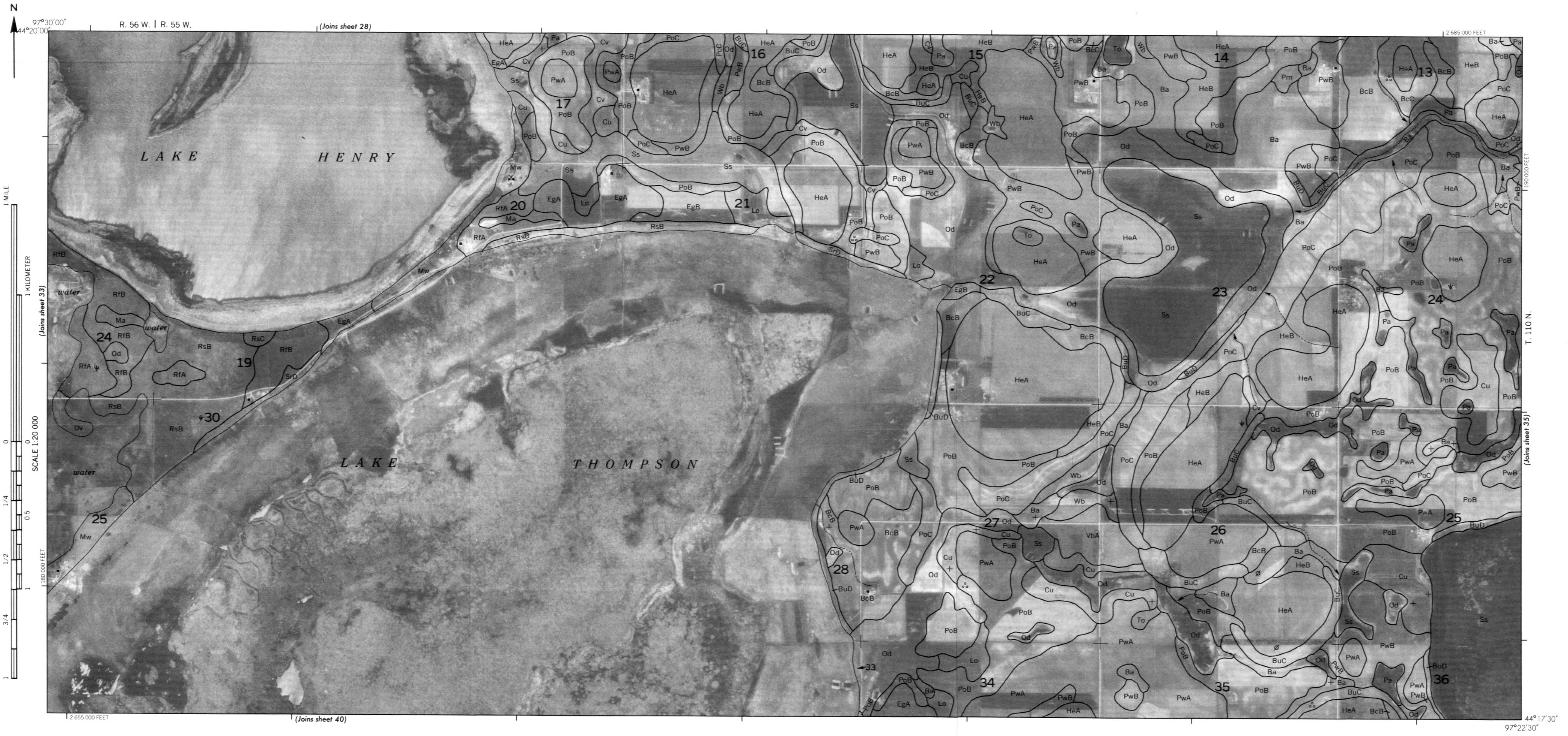

N
R. 54 W. | R. 53 W.
97°15'00"
44°22'30"
(Joins sheet 24)
2 750 000 FEET
210 000 FEET
T. 111 N.
T. 110 N.
(Joins sheet 29)
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5
195 000 FEET
2 720 000 FEET
(Joins sheet 36)
44°20'00"
97°7'30"
Arlington
DAKOTA MINNESOTA AND EASTERN RAILROAD
BROOKINGS COUNTY
Lake Whitewood
31
32
33
34
35
36
6
5
4
3
2
1
7
8
9
10
11
12
18
17
16
15
14
13

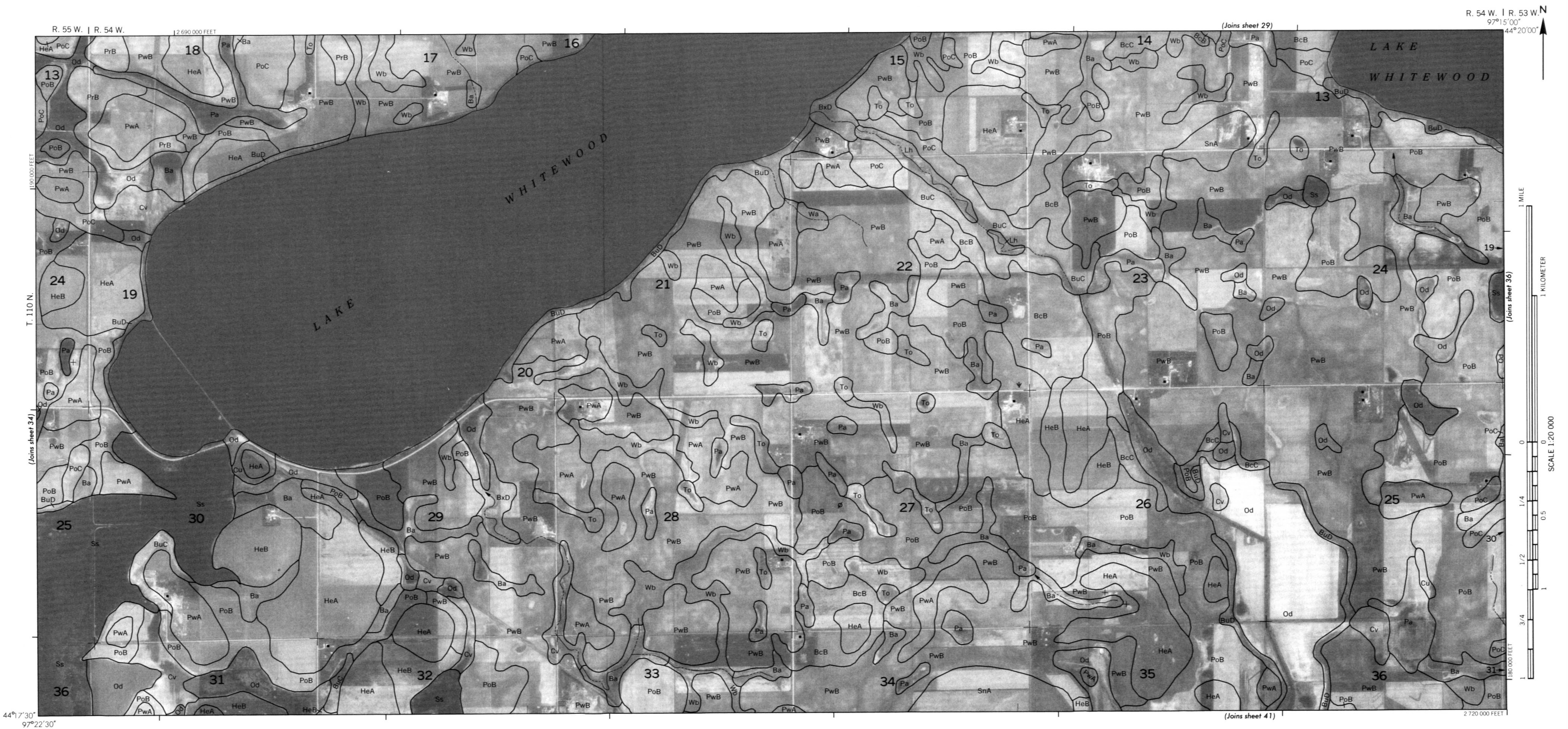
31


N
2 560 000 FEET
R. 58 W.
(Joins sheet 25)
97°45'00"
44°20'00"
185 000 FEET
BEADLE COUNTY
T. 110 N.
18
17
16
15
14
13
19
20
21
22
23
24
30
29
28
27
26
25
31
32
33
34
35
36
West Redstone Creek
(Joins sheet 32)
1 MILE
1 KILOMETER
SCALE 1:20 000
180 000 FEET
(Joins sheet 37)
2 585 000 FEET
44°17'30"
97°52'30"

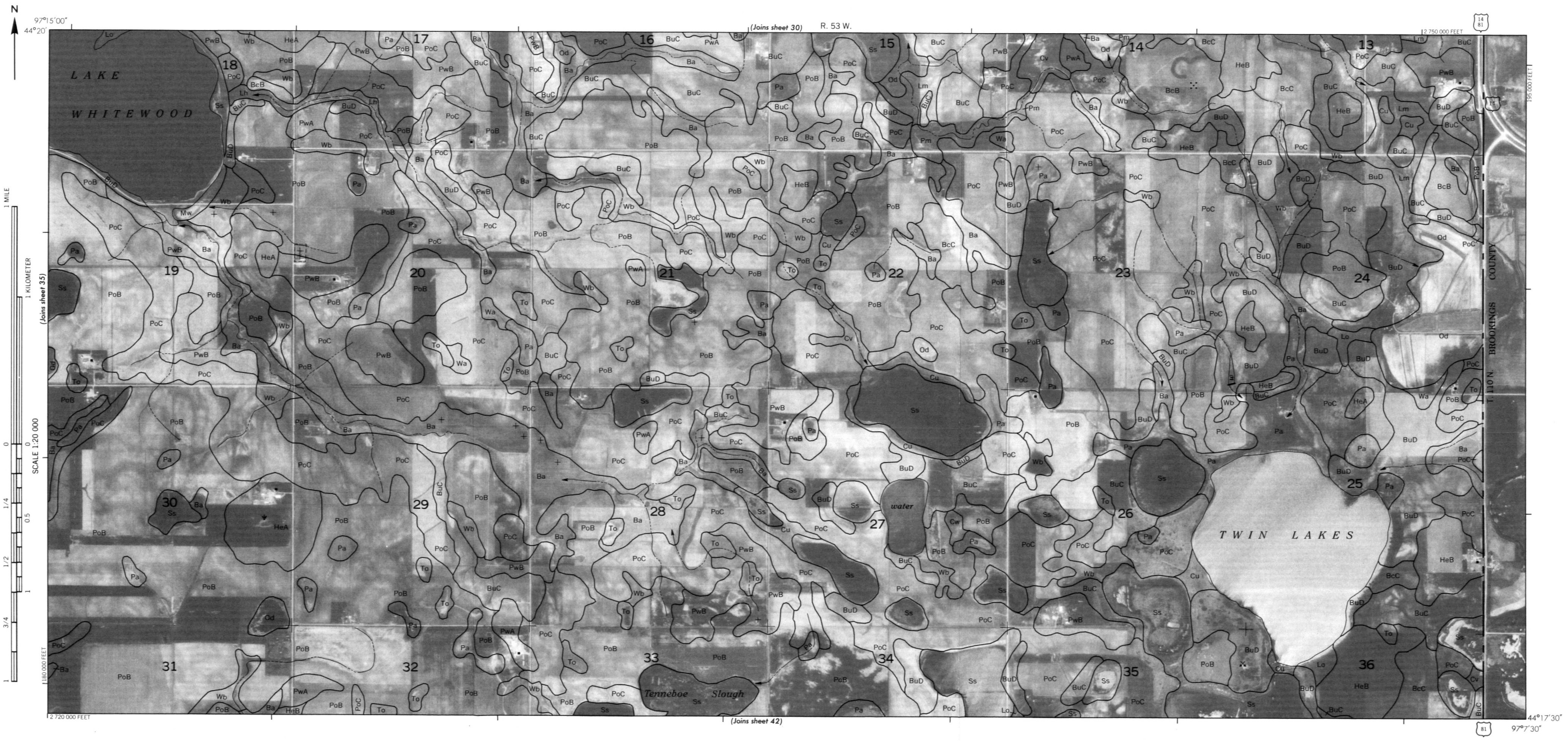

N
97°45′00″
(Joins sheet 26)
R. 58 W. | R. 57 W.
2 620 000 FEET
190 000 FEET
(Joins sheet 31)
T. 110 N.
(Joins sheet 33)
180 000 FEET
2 590 000 FEET
(Joins sheet 38)
44°17′30″
97°37′30″
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1
Redstone
Creek
water
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

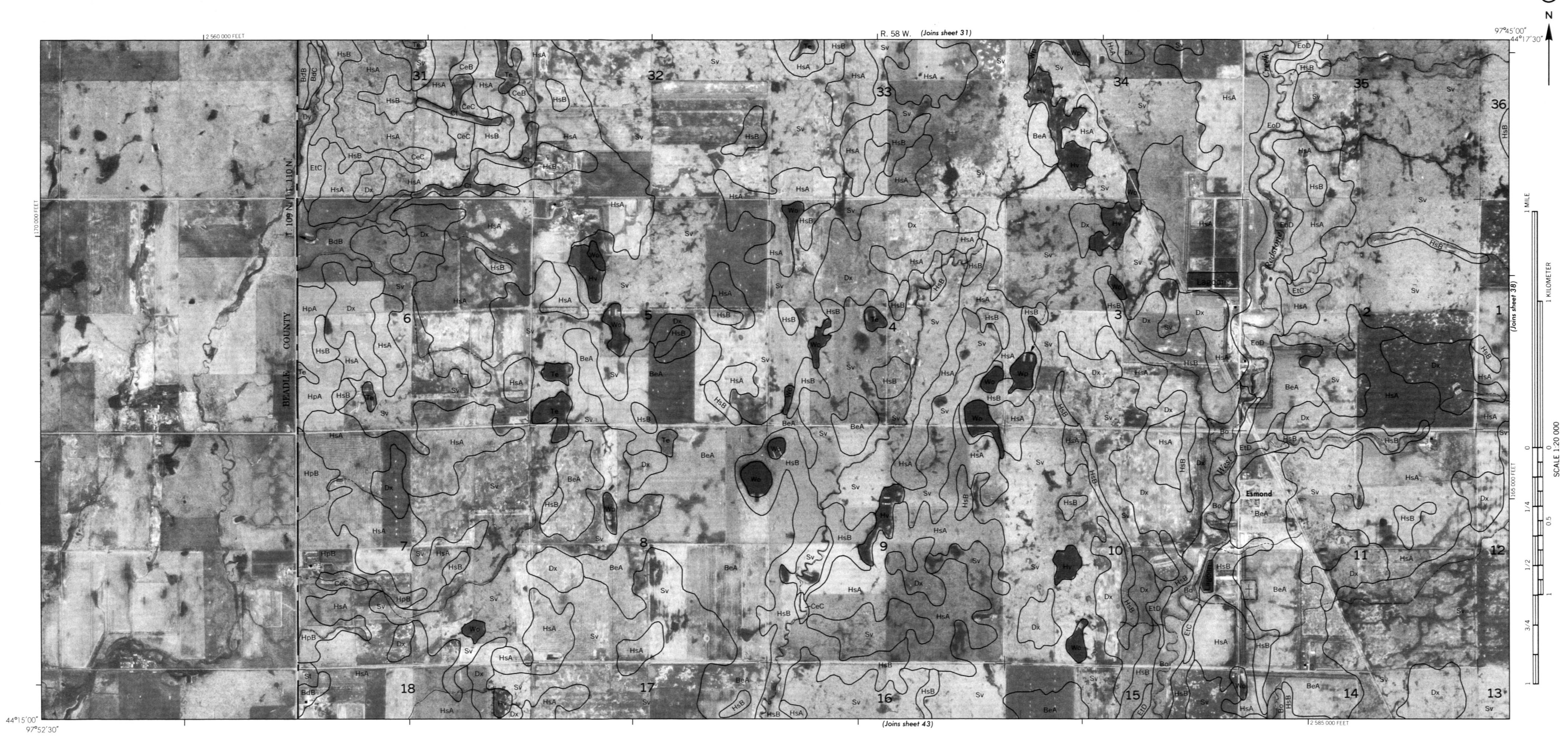

33
N
R. 57 W. | R. 56 W.
2 625 000 FEET
(Joins sheet 27)
97°30'00"
44°20'00"
190 000 FEET
T. 110 N.
(Joins sheet 32)
(Joins sheet 34)
(Joins sheet 39)
2 650 000 FEET
180 000 FEET
44°17'30"
97°37'30"
LAKE HENRY
Lake Thompson
Rock Creek
1 MILE
1 KILOMETER
SCALE 1:20 000


N
97°30'00"
44°20'00"
R. 56 W. | R. 55 W.
(Joins sheet 28)
2 685 000 FEET
LAKE HENRY
LAKE THOMPSON
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 40)
T. 110 N.
190 000 FEET
180 000 FEET
2 655 000 FEET
44°17'30"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5
water
13
14
15
16
17
19
20
21
22
23
24
25
26
27
28
30
33
34
35
36

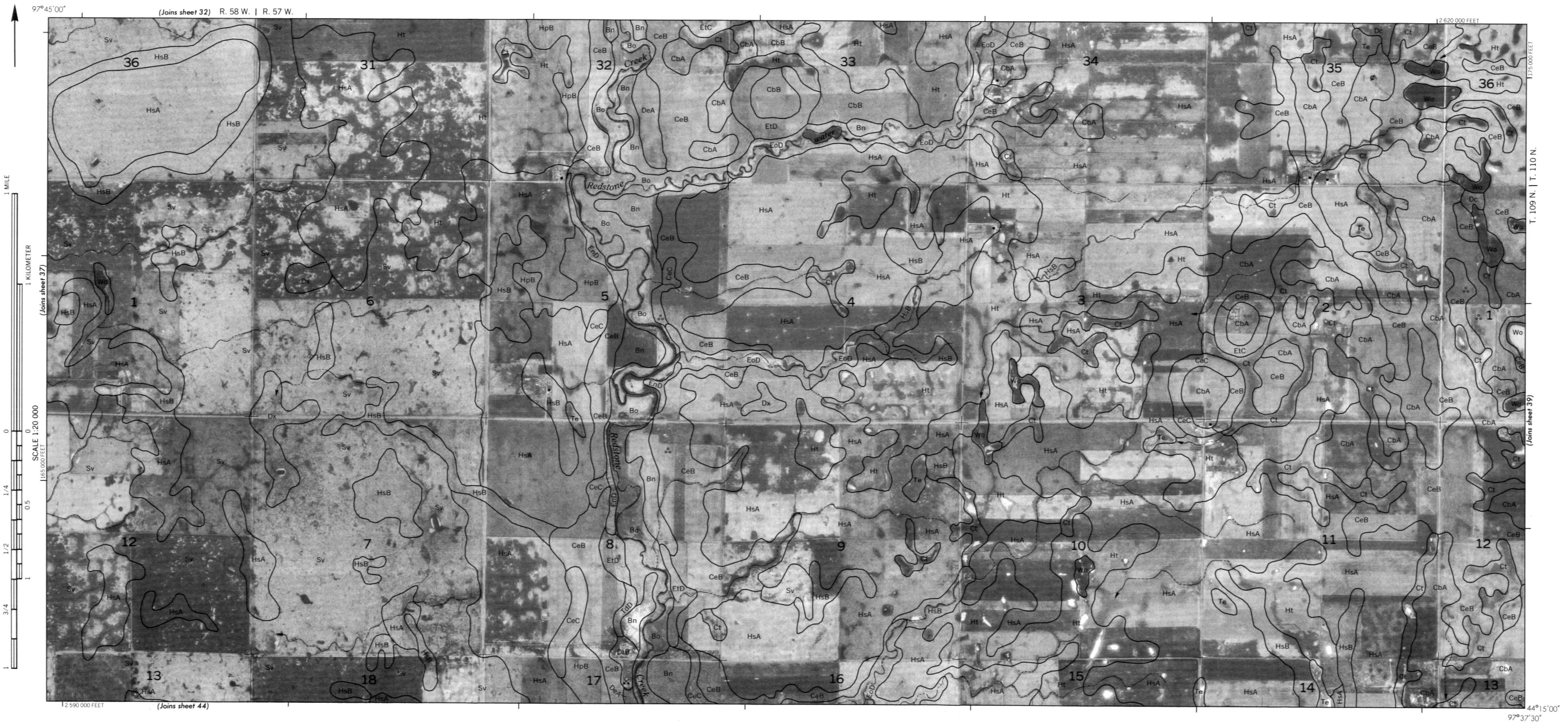

35
R. 55 W. | R. 54 W.
R. 54 W. | R. 53 W.
97°15'00"
44°20'00"
N
(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 41)
T. 110 N.
LAKE WHITEWOOD
LAKE WHITEWOOD
2 690 000 FEET
2 720 000 FEET
190 000 FEET
180 000 FEET
44°17'30"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000

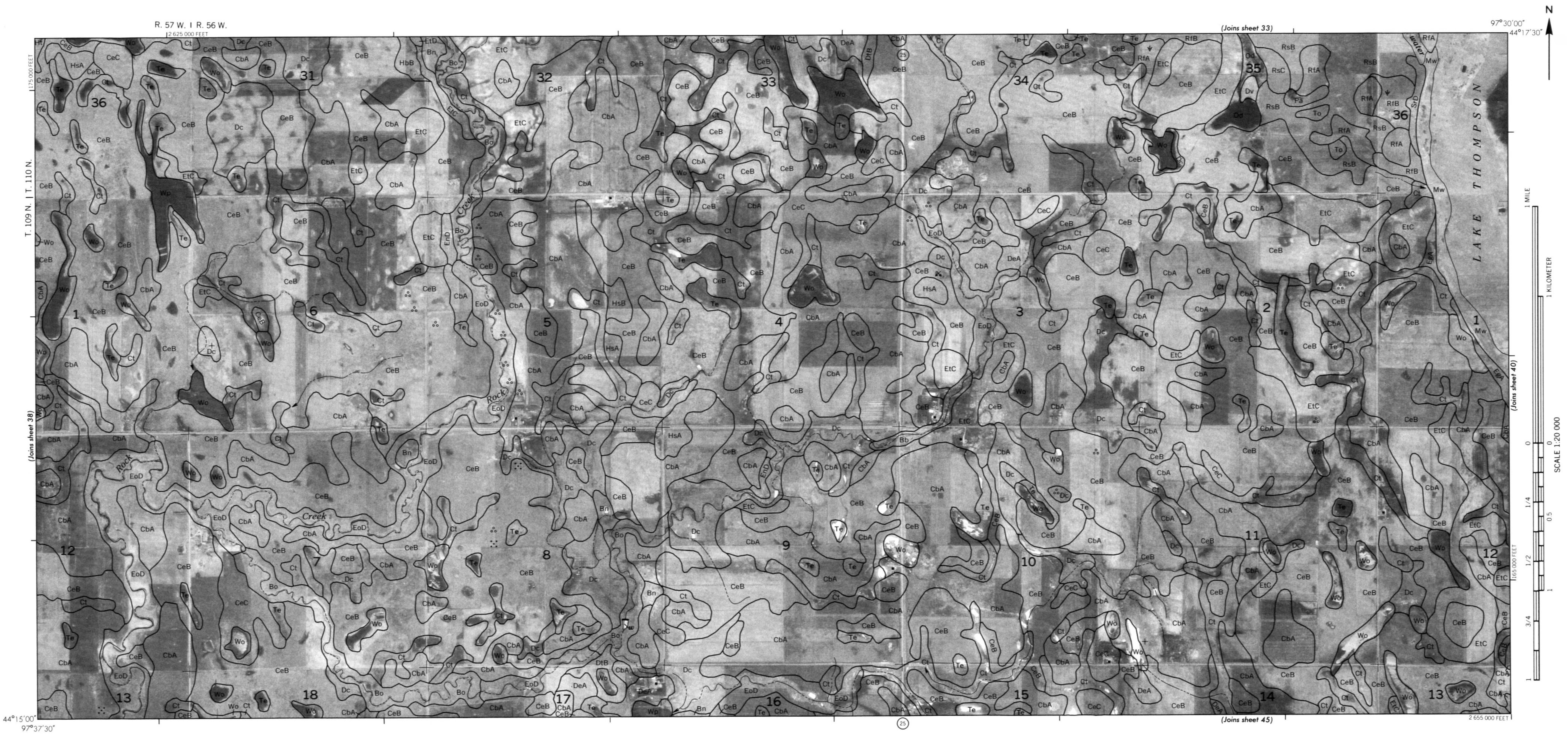
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 36



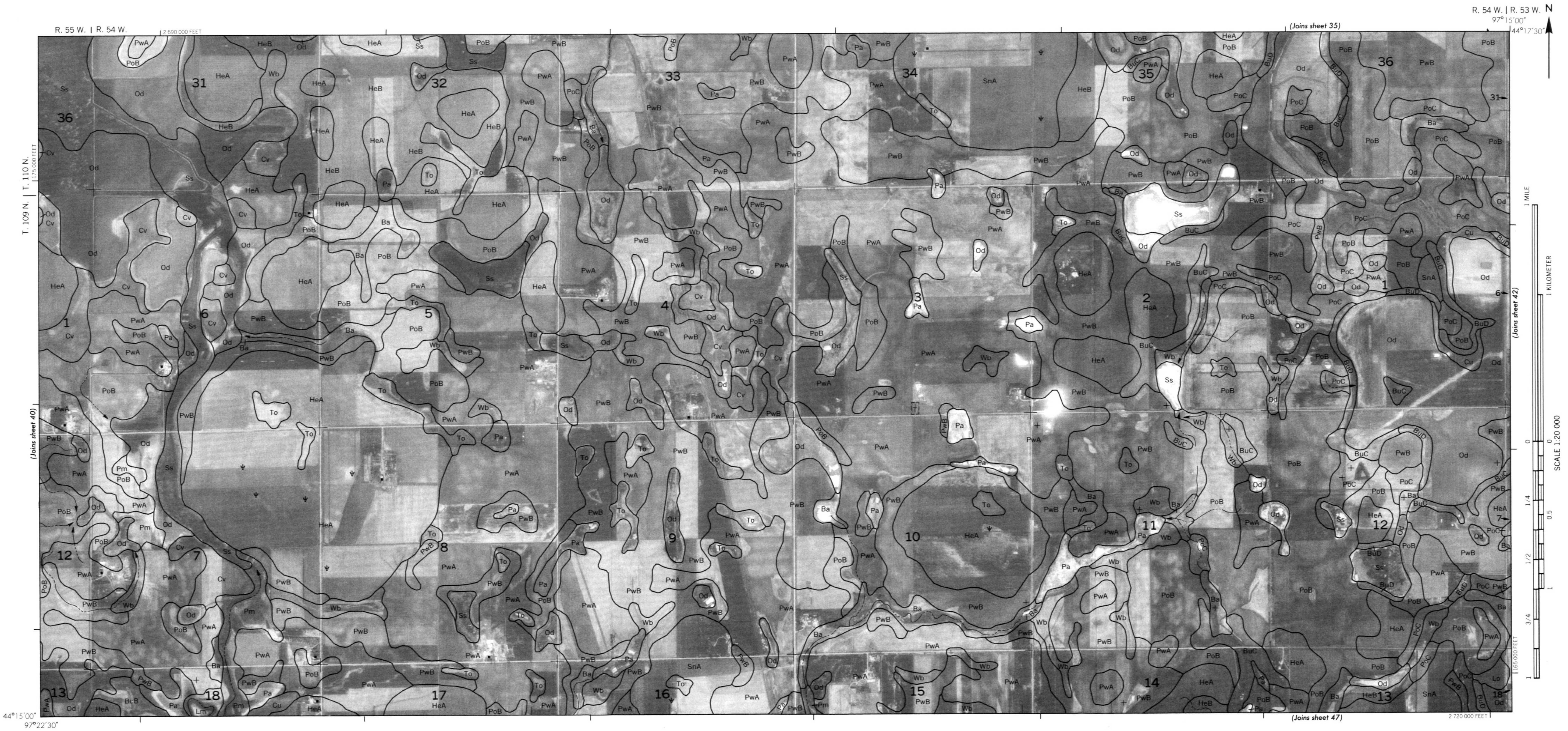

37
N
R. 58 W. (Joins sheet 31)
(Joins sheet 38)
(Joins sheet 43)
T. 110 N.
T. 109 N.
BEADLE COUNTY
Esmond
Redstone
West
Creek
Lagoon
2 560 000 FEET
2 585 000 FEET
170 000 FEET
165 000 FEET
44°17'30"
97°45'00"
44°15'00"
97°52'30"
1 MILE
1 KILOMETER
SCALE 1:20 000

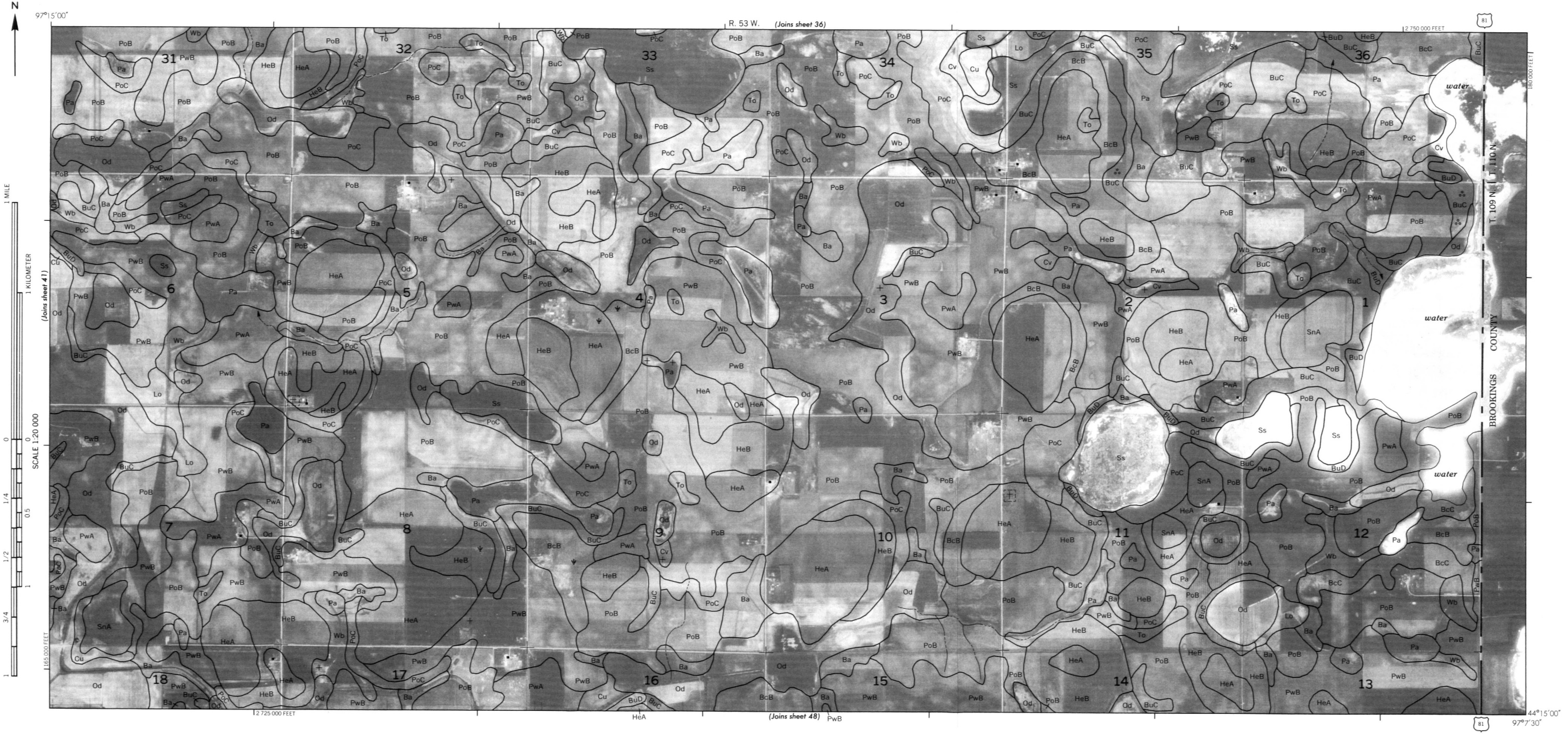
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 38

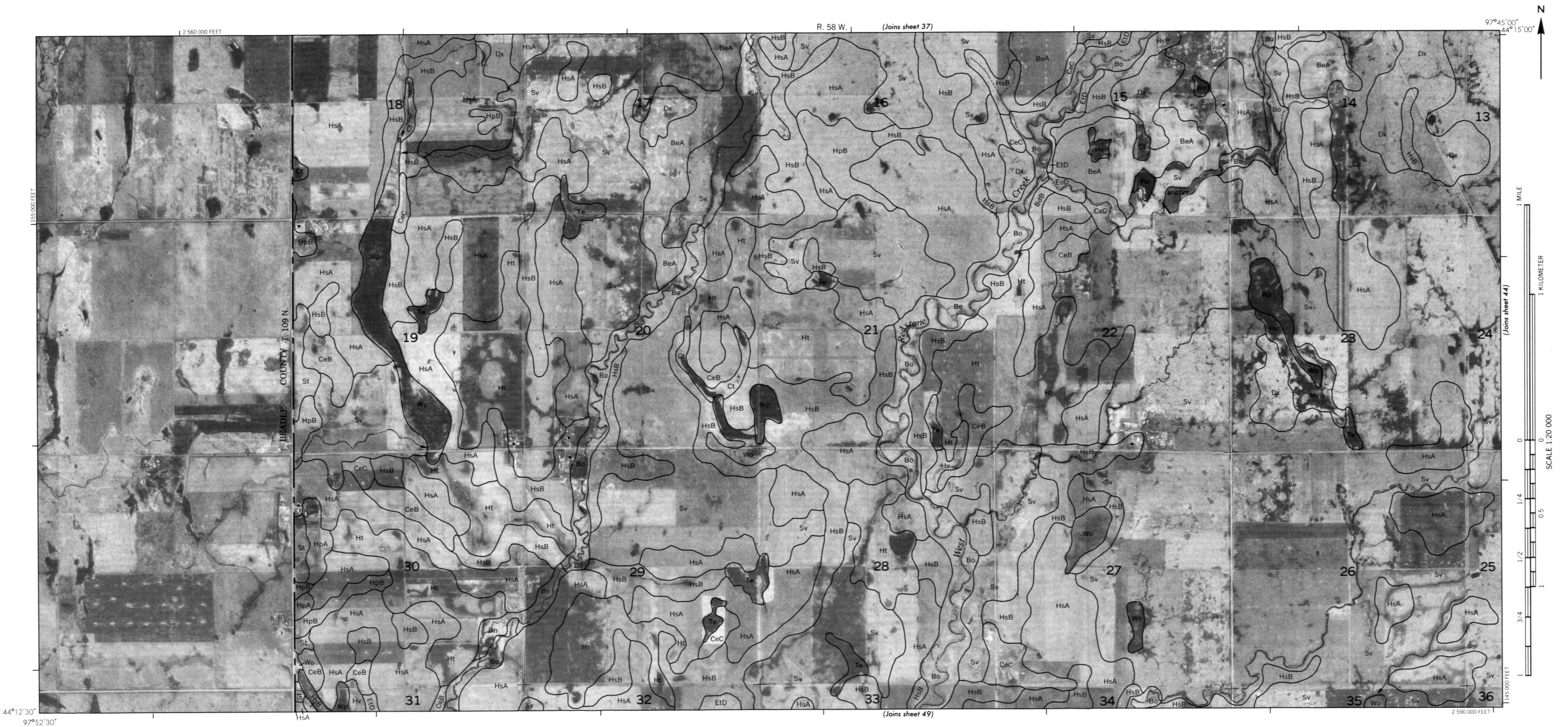



N
R. 57 W. | R. 56 W.
2 625 000 FEET
(Joins sheet 33)
97°30′00″
44°17′30″
T. 109 N. | T. 110 N.
175 000 FEET
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 45)
44°15′00″
97°37′30″
2 655 000 FEET
165 000 FEET
LAKE THOMPSON
Rock Creek
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5
25

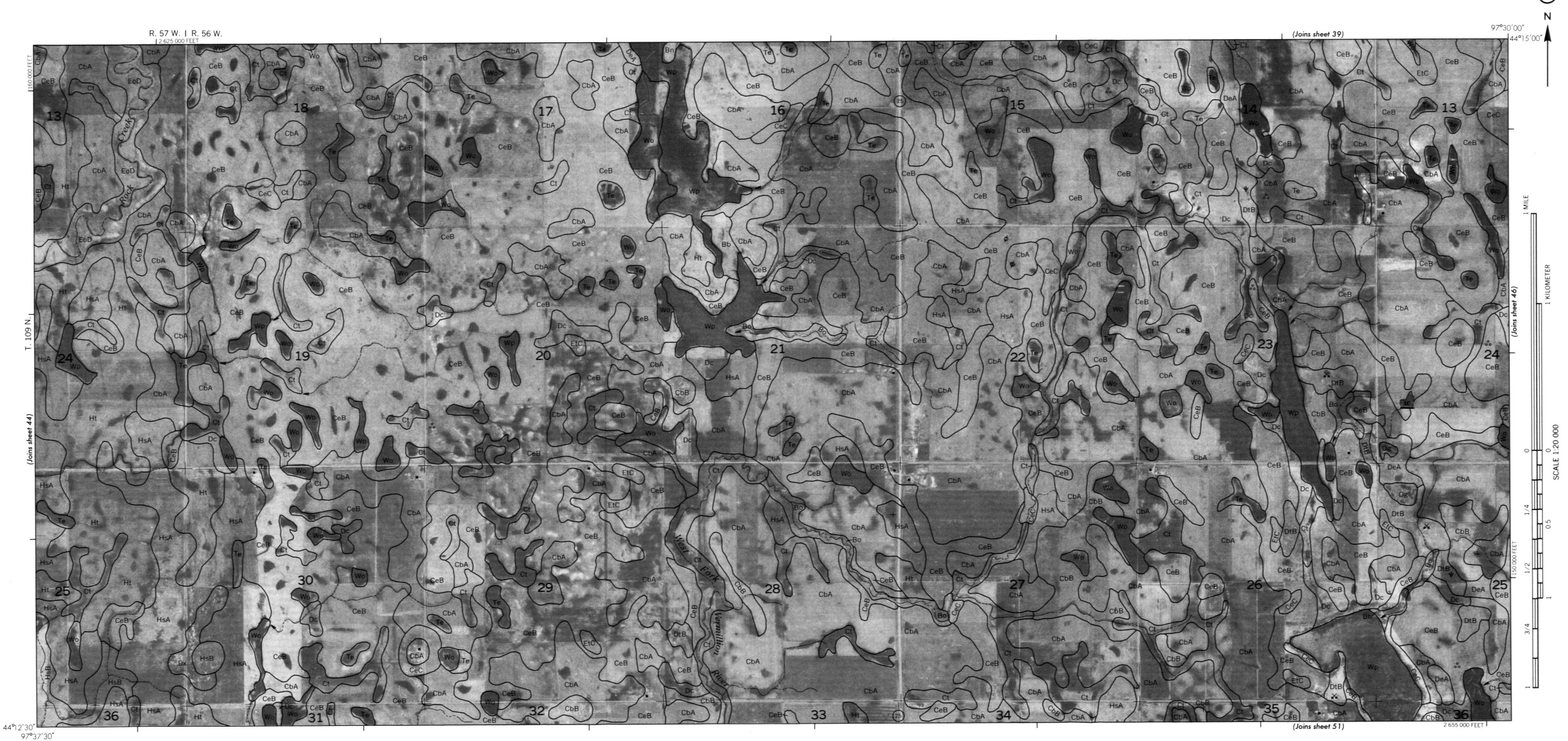
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 40


R. 55 W. | R. 54 W.
2 690 000 FEET
(Joins sheet 35)
R. 54 W. | R. 53 W.
N
97°15'00"
44°17'30"
T. 109 N. | T. 110 N.
175 000 FEET
(Joins sheet 40)
(Joins sheet 42)
1 MILE
1 KILOMETER
SCALE 1:20 000
165 000 FEET
44°15'00"
97°22'30"
(Joins sheet 47)
2 720 000 FEET


N
97°15'00"
R. 53 W.
(Joins sheet 36)
(Joins sheet 41)
(Joins sheet 48)
T. 110 N.
T. 109 N.
BROOKINGS COUNTY
44°15'00"
97°7'30"
2 750 000 FEET
2 725 000 FEET
180 000 FEET
165 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

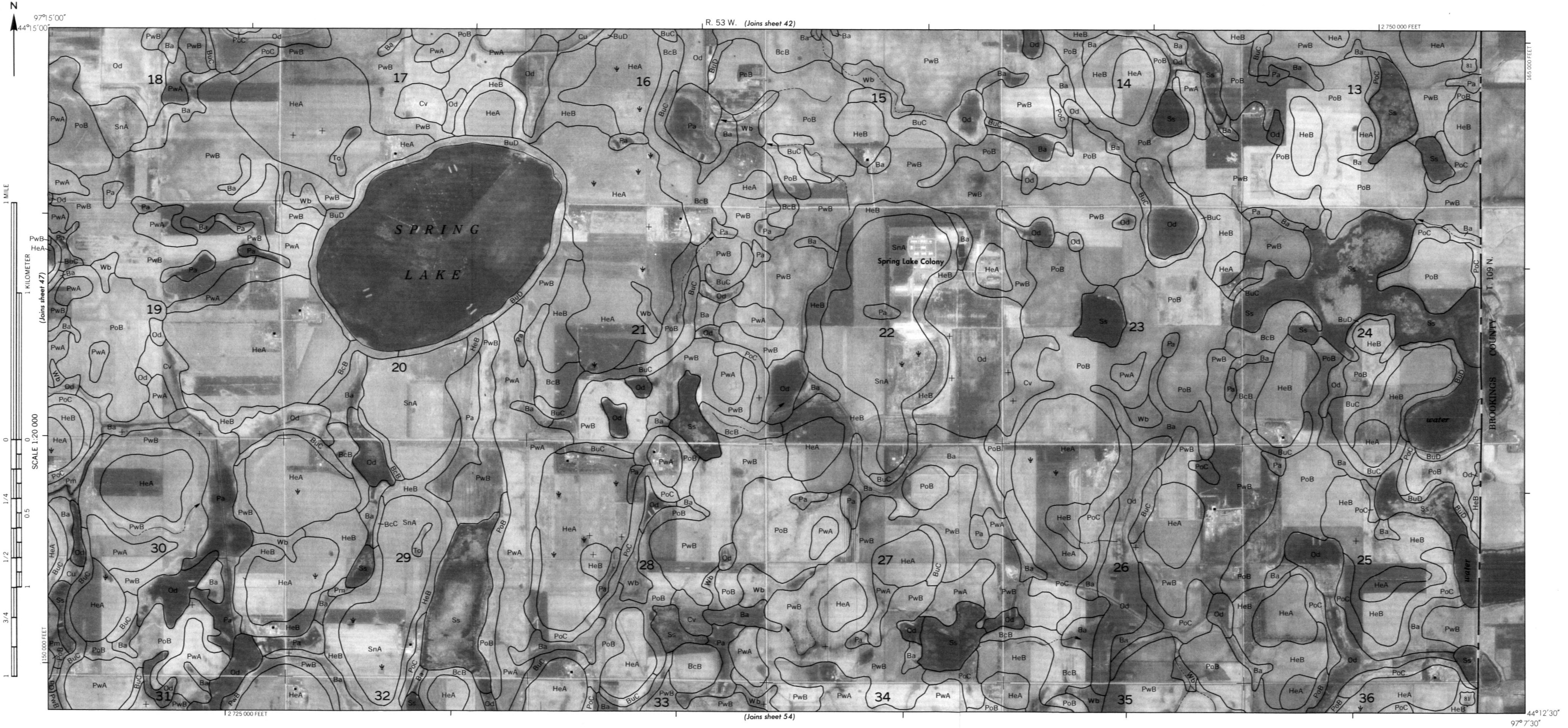

43
N
R. 58 W.
(Joins sheet 37)
(Joins sheet 44)
(Joins sheet 49)
BEADLE COUNTY
T. 109 N.
2 560 000 FEET
2 590 000 FEET
155 000 FEET
145 000 FEET
97°45'00"
44°15'00"
44°12'30"
97°52'30"
Redstone Creek
West
1 MILE
1 KILOMETER
SCALE 1:20 000

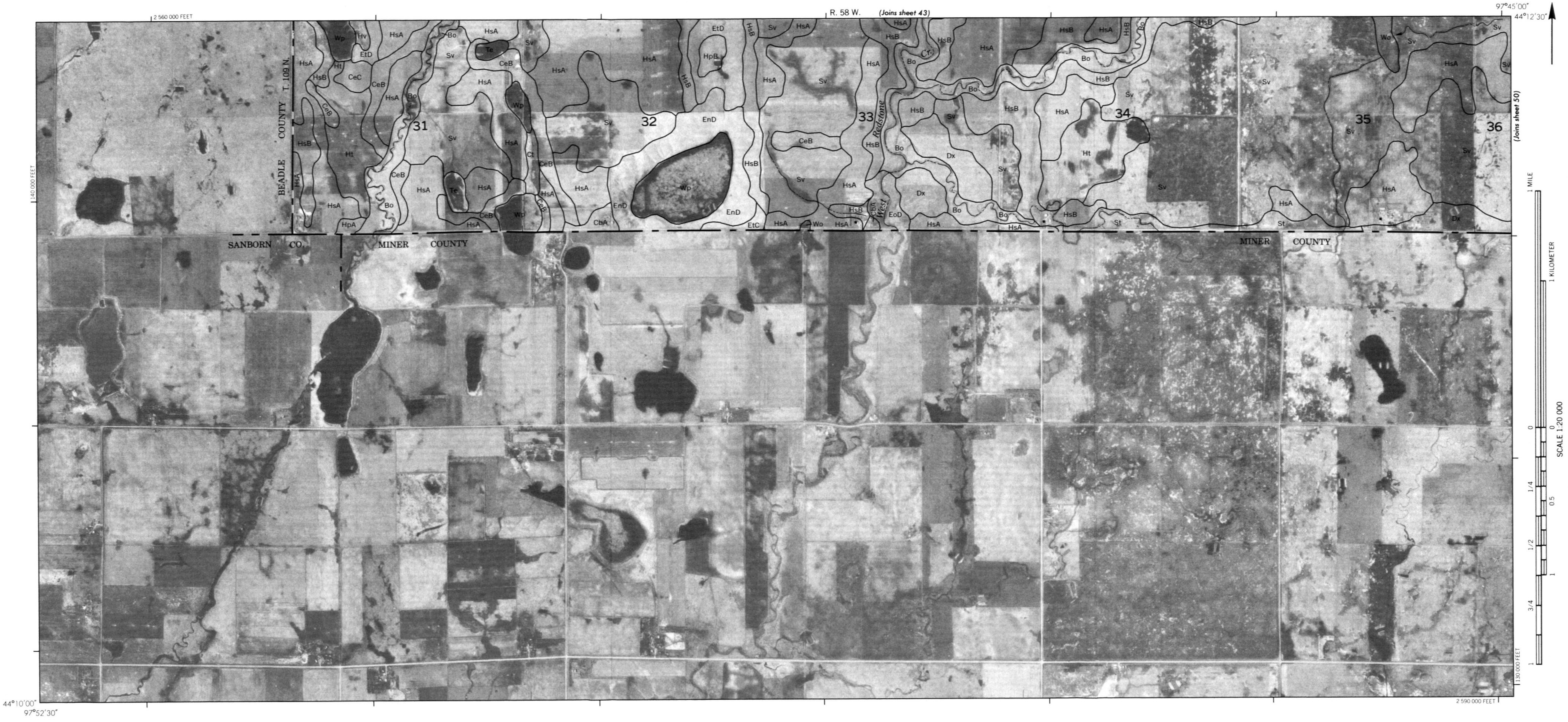
SOIL SURVEY OF KINGSBURY COUNTY, SOUTH DAKOTA - SHEET NUMBER 44


45
N
R. 57 W. | R. 56 W.
2 625 000 FEET
(Joins sheet 39)
97°30'00"
44°15'00"
150 000 FEET
T. 109 N.
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 51)
44°12'30"
97°37'30"
2 655 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000
West Fork Vermillion River
Rock Creek

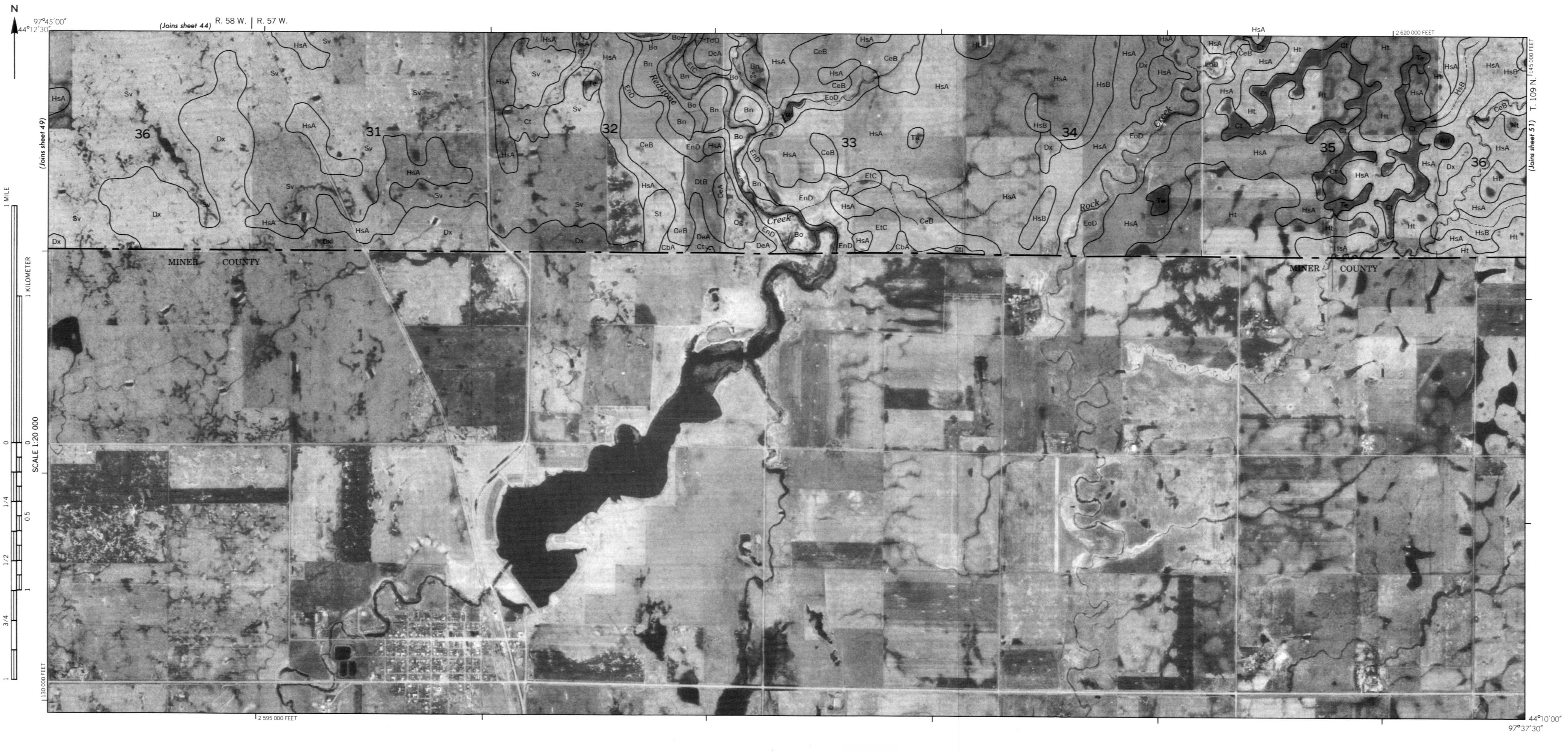

N
97°30'00"
44°15'
R. 56 W. | R. 55 W.
(Joins sheet 40)
2 685 000 FEET
160 000 FEET
T. 109 N.
(Joins sheet 47)
(Joins sheet 45)
LAKE THOMPSON
2 660 000 FEET
(Joins sheet 52)
150 000 FEET
44°12'30"
97°22'30"
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1

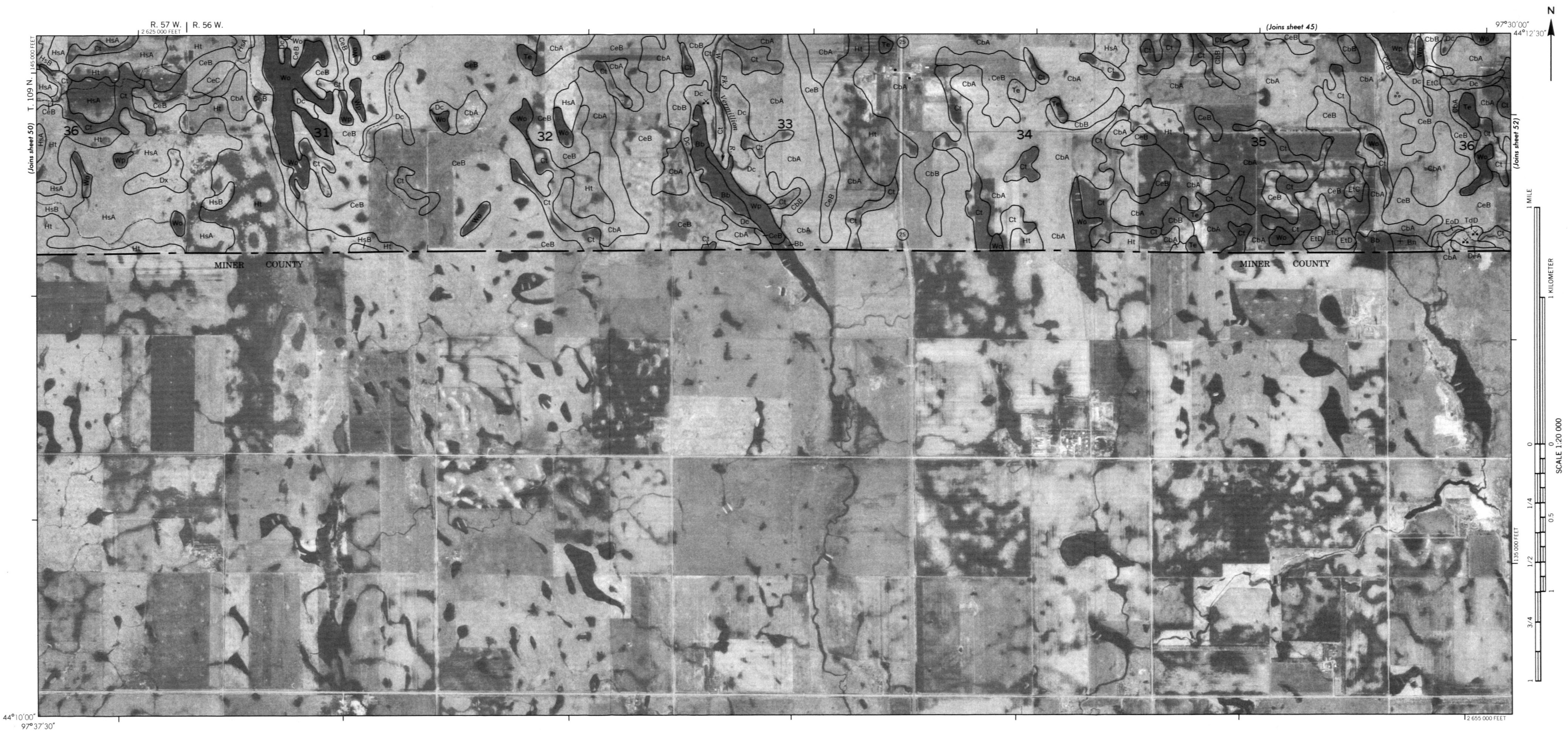

R. 55 W. | R. 54 W.
R. 54 W. | R. 53 W.
N
(Joins sheet 41)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 53)
T. 109 N.
Oldham
44°15'00"
97°15'00"
44°12'30"
97°22'30"
2 690 000 FEET
2 720 000 FEET
160 000 FEET
150 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000


N
97°15'00"
44°15'00"
R. 53 W. (Joins sheet 42)
2 750 000 FEET
165 000 FEET
(Joins sheet 47)
SPRING LAKE
Spring Lake Colony
BROOKINGS COUNTY
T. 109 N.
1 MILE
1 KILOMETER
SCALE 1:20 000
150 000 FEET
2 725 000 FEET
(Joins sheet 54)
44°12'30"
97°7'30"

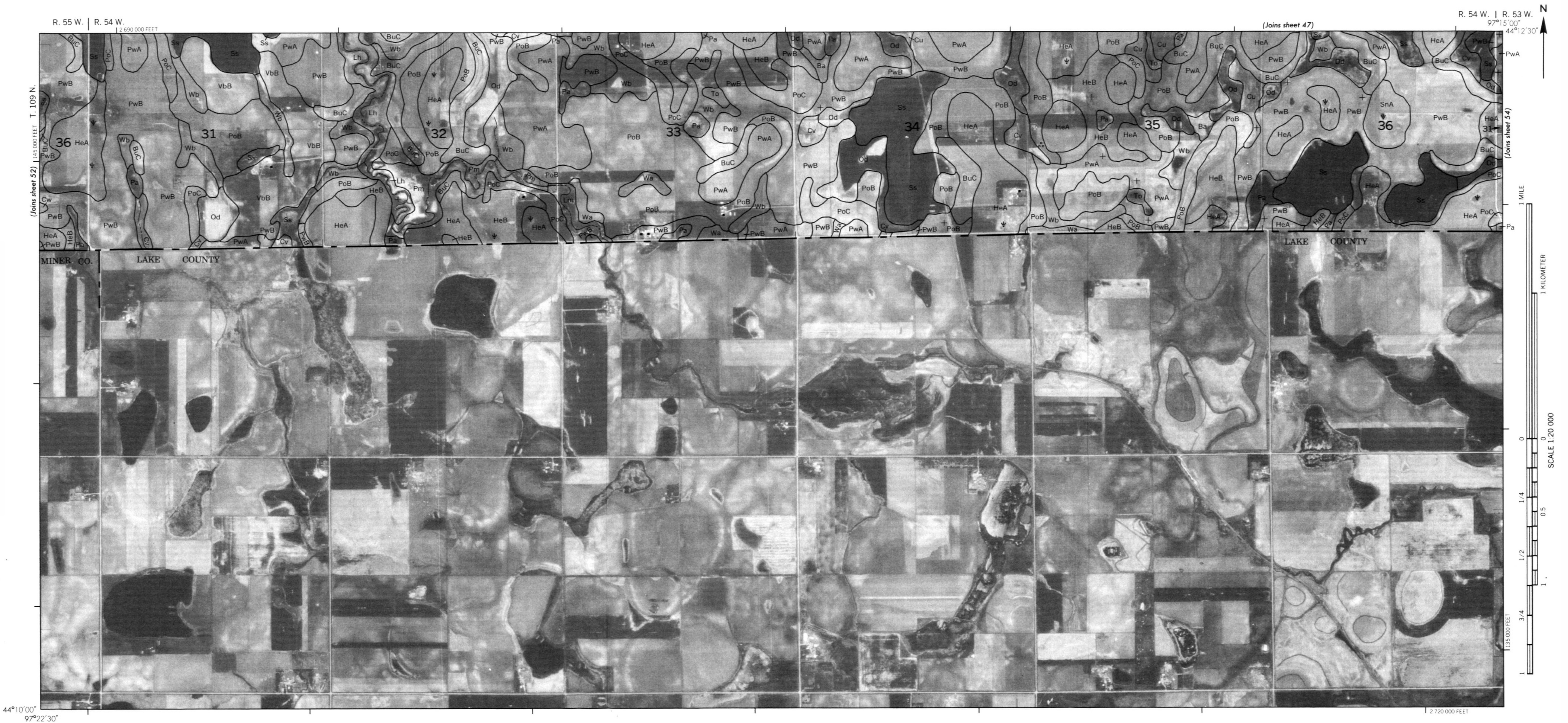


2 560 000 FEET
R. 58 W.
(Joins sheet 43)
97°45'00"
44°12'30"
N
T. 109 N.
BEADLE COUNTY
140 000 FEET
(Joins sheet 50)
31
32
33
34
35
36
Redstone
Cr.
West
SANBORN CO.
MINER COUNTY
MINER COUNTY
1 MILE
1 KILOMETER
SCALE 1:20 000
130 000 FEET
2 590 000 FEET
44°10'00"
97°52'30"


N
97°45'00"
44°12'30"
(Joins sheet 44)
R. 58 W.
R. 57 W.
(Joins sheet 49)
(Joins sheet 51)
T. 109 N.
2 620 000 FEET
145 000 FEET
130 000 FEET
2 595 000 FEET
MINER COUNTY
MINER COUNTY
Redstone Creek
Rock Creek
36
31
32
33
34
35
36
1 MILE
1 KILOMETER
SCALE 1:20 000
44°10'00"
97°37'30"


N
R. 57 W. | R. 56 W.
2 625 000 FEET
145 000 FEET
T. 109 N.
(Joins sheet 45)
97°30'00"
44°12'30"
(Joins sheet 50)
(Joins sheet 52)
36
31
32
33
34
35
36
Vermillion
MINER COUNTY
MINER COUNTY
25
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0.5
135 000 FEET
44°10'00"
97°37'30"
2 655 000 FEET


N
97°30'00"
44°12'30"
R. 56 W. | R. 55 W.
(Joins sheet 46)
(Joins sheet 51)
(Joins sheet 53)
T. 109 N.
2 685 000 FEET
145 000 FEET
135 000 FEET
2 660 000 FEET
36
31
32
33
34
35
36
LAKE THOMPSON
MINER COUNTY
MINER COUNTY
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1
44°10'00"
97°22'30"


R. 55 W. | R. 54 W.
2 690 000 FEET
(Joins sheet 47)
R. 54 W. | R. 53 W.
97°15'00"
44°12'30"
N
T. 109 N.
145 000 FEET
(Joins sheet 52)
(Joins sheet 54)
36
31
32
33
34
35
36
MINER CO.
LAKE COUNTY
LAKE COUNTY
44°10'00"
97°22'30"
2 720 000 FEET
135 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1


N
97°15'00"
44°12'30"
R. 53 W.
(Joins sheet 48)
(Joins sheet 53)
2 750 000 FEET
150 000 FEET
T. 109 N.
BROOKINGS COUNTY
LAKE COUNTY
31
32
33
34
35
36
1 MILE
1 KILOMETER
SCALE 1:20 000
135 000 FEET
2 725 000 FEET
44°10'00"
97°7'30"